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FOREST AND RANGE EVALUATION PROGRAM

October 2006

# Recreation Site Effectiveness Evaluation Project

BRITISH COLUMBIA
Ministry of Forests and Range
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## Executive Summary

### *Project Overview*

The Recreation Site Effectiveness Evaluation Pilot Project was designed to gather baseline information about the current state of Ministry of Forests and Range (MoFR)[1] recreation sites throughout British Columbia, and to evaluate the effectiveness of current recreation site management policies and practices within the province. More specifically, the project addresses the following primary research question:

*Are Forest Service recreation sites across British Columbia meeting baseline standards for facilities and maintenance, and able to provide safe, sanitary and environmentally sound recreation experiences?*

Operating under the auspices of the Forest and Range Evaluation Program (FREP),[2] the Recreation Site Effectiveness Evaluation Project Working Group (RSEEWG) developed a detailed project plan (Ministry of Forests 2004) and a Recreation Site Evaluation Field Form (Appendix 1) in early 2004. Field surveys were subsequently completed throughout the summer and fall of 2004.

The RSEEWG identified four specific research objectives upon initiation of the pilot project (Ministry of Forests 2004):

1. To assess the effectiveness of current management practices;
2. To identify any differences in the state of recreation sites in different MoFR forest regions, and between different types of recreation sites [i.e., managed with fees (MWF), managed without fees (MWOF), and user maintained (UM)];
3. To estimate the resources and infrastructure required to restore and/or maintain recreation sites to baseline ministry standards; and
4. To adjust the ministry formula for allocating recreation funds to forest regions, if required.

Although there are 1292 Forest Service recreation sites located across British Columbia, the survey population was restricted to recreation sites with vehicle access and overnight camping facilities (1187 sites). From these, a stratified simple random sample of 120 sites was selected for field evaluation.

To reflect the actual distribution of recreation sites across the province, sites were first stratified by MoFR forest region: 60 sites were located in the Southern Interior Forest Region (SIR), and 30 were located in each of the Coast Forest Region (CFR) and Northern Interior Forest Region (NIR). Site selection was further stratified by the three MoFR recreation site types: (i) MWF (38 sites), (ii) MWOF (36 sites), and (iii) UM (46 sites). The final stratification variable was site size: sites with < 20 vehicle units (small), and sites with > 20 vehicle units (large). Sites were allocated into one of these 18 strata, and results were pooled by either forest region or site type. Field data were collected between September and December 2004.

### *Results*

In order to facilitate the data analysis for this report, results were categorised into five focus areas and more specific research questions were identified:[3]

1. **Site Safety:** Are recreation sites safe?
2. **Sanitation:** Are recreation sites sanitary?
3. **Facilities and Maintenance:** Are recreation sites meeting the ministry's baseline standards for facilities and maintenance?
4. **Environmental Quality:** Are recreation sites posing risks to environmental quality?
5. **Site Design:** Are recreation sites meeting the ministry's baseline standards for site design?

Overall, study results were favourable. They suggest that Forest Service recreation sites are generally meeting the objectives of the BC Forest Recreation Program and are providing safe, sanitary and environmentally sound recreation experiences to the public.

1 Responsibility for the management of Forest Service Recreation Sites no longer falls under the jurisdiction of the Ministry of Forests and Range (MoFR), formerly the Ministry of Forests (MoF). As of June 2005, this responsibility became the mandate of the BC Ministry of Tourism, Sport and the Arts (MTSA).

2 When FREP was first conceived, it was called the FRPA Resource Evaluation Program. Recently, the name has been changed to the **Forest and Range Evaluation Program**.

3 Adapted from Hull (2005).

At the individual site level, however, a number of problems were identified that require serious attention. Among them:

- Site Safety
  - Although the presence of natural hazards was limited (7% of sites), 75% were not clearly identified (i.e., through signage or other means).
  - 68% of recreation sites had hazard trees requiring a full hazard tree evaluation.
  - 53% of past wildlife danger tree hazard recommendations had not been carried out.
- Sanitation
  - Human and domestic animal waste were found outside of toilet facilities on 9% and 20% of sites, respectively.
  - Unsightly garbage was present on 90% of recreation sites, unsanitary garbage on 28% of sites, and broken glass on 51% of sites – dispersal was largely limited to a few occurrences or less per site.
  - Of those sites with a shoreline, 51% had some amount of garbage, glass and/or hazardous waste present on or near the shoreline.
  - Human and/or domestic animal waste was found on 55% of recreation sites, with 6% of sites having waste spread uniformly throughout the site.
- Environmental Quality
  - Moderate to high levels of rutting, ponding or erosion were found on 34% of road systems/ parking areas.
  - The vast majority of recreation sites across the province (89%) have evidence of tree vandalism on an average of 15% of trees per site.
  - Root damage was evident on 41% of recreation sites, and root/heart rot on 17% of sites.
  - Bark beetle infection was found on 36% of recreation sites across the province and 55% of sites in the NIR.
  - Invasive species were identified on 20% of sites across the province, with diffuse knapweed and spotted knapweed the most widely identified species.
  - In the CFR, the majority of sites (72%) had user-made trails leading to the shoreline and 33% of these require remediation.
- Facilities and Maintenance
  - Over ¼ of entrance signs, docks/wharves/piers, fire rings, and kiosks were found to be non-functional or below MoFR standards.

  - Approximately 85 ± 15% of docks/wharves/piers require remedial works, with 40% requiring outright removal or replacement.
  - More than half of tables (58 ± 9%), fire rings (64 ± 9%), and campsites (55 ± 10%) require remedial works across the province.
  - Remedial works were required on 57 ± 1% of all in-site roads.
  - The number of kiosks and directional signs will need to more than double to meet visitor needs.
- Site Design
  - Site design and layout were considered poor on 13 ± 9% of sites across the province, and on 17 ± 14% of user maintained sites.

The intent of this document is to report on the pilot project's findings to date, and provide some preliminary discussion about the implications for future maintenance and management of forest recreation sites in BC. In addition, this document will provide recommendations for improving the evaluation process, survey instruments and study design for future recreation effectiveness evaluations.

## Acknowledgements

Saila Hull's masters project (Hull 2005) significantly contributed to the design and content of this report, and elements of her work that are not included here will be valuable for improving the design and implementation of future effectiveness evaluations.

Many others were involved in the design and implementation of the project, including members of the Recreation Site Effectiveness Evaluation Working Group and others: Bill Marshall, John Crooks, Carl Johansen, Noelle Kekula, Eric Kopetski, Wendy Bergerud, Len Leroux, Paul Tataryn, Gary Westfall and Thomas Chen.

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## 1.0 Introduction

British Columbia is globally renowned for the extensive outdoor recreation opportunities afforded by the province's unparalleled natural beauty and vast tracts of wilderness. The Ministry of Forests and Range (MoFR)[4] recreation program was designed to manage recreation use, and provide opportunities for recreational experiences and benefits by protecting recreation resources on Crown forest lands (Ministry of Forests 2000). Currently, 1292 Forest Service recreation sites are located around British Columbia for the camping enjoyment of residents and visitors to the province. These include: campgrounds, day-use areas, boat launches, roads and trails, and other facilities that enable the public to enjoy recreation experiences in a forest setting.

The primary focus of the MoFR recreation program was to provide safe, sanitary and environmentally sound recreation facilities, structures (e.g., tables, toilets, signs, etc.) and trails for public use that complement and blend with the natural surroundings (Ministry of Forests 2000). As of June 2005, responsibility for the management and maintenance of forest recreation sites became the mandate of the newly formed BC Ministry of Tourism, Sport and the Arts (MTSA). It is anticipated that the forest recreation program will be managed under MTSA in the same manner it was under MoFR, and that the recreation provisions in the *Forest and Range Practices Act* (FRPA) will remain in effect. At the time of writing, the recreation responsibilities under the Forest and Range Evaluation Program (FREP) were being transferred to the Minister of MTSA. Recreation will continue to be one of the forest values evaluated under FREP, since forest recreation values continue to be of critical importance in British Columbia, and evaluating the effectiveness of relevant management policies and practices remains crucial.

In the summer of 2004, the Recreation Site Effectiveness Evaluation Working Group (RSEEWG) was established to participate in the newly implemented FREP. The working group's focus was to assess whether forest and range practices in BC are achieving government objectives for the recreation resource value; one of 11 focal resource values identified under section 149 of FRPA. In 2004/2005, the working group designed and conducted the Recreation Site Effectiveness Evaluation Pilot Project in order to gather baseline information about the current state of recreation sites throughout BC. More specifically, the pilot project was designed to address the following primary research question:

*Are Forest Service recreation sites across British Columbia meeting baseline standards for facilities and maintenance, and able to provide safe, sanitary and environmentally sound recreation experiences?*

Although the project was initiated under the auspices of FREP, it has also served to address previous concerns about the declining quality of recreation experiences across the province due to a lack of adequate government resources. To address this issue, the MoFR introduced a strategy in 2002 to manage and maintain recreation sites and trails in partnership with community groups, outdoor clubs, forest companies, First Nations, regional districts and others. Recreation sites and trails that were not managed under partnership agreements would be maintained by site users. With its partners, the MoFR was therefore ultimately responsible for managing three types of recreation sites:

1. **Managed sites with fees:** These sites are managed through partnership agreements. Camping fees are charged to offset the cost of services provided by the agreement holder in cases where the ministry has determined that the services provided warrant the fee. Services may include supervision, daily maintenance and facility/structure maintenance. The agreement holder collects the fees on site and retains the fees to pay for the services. At the time of the study, there were a total of 147 managed sites with fees. Camping fees ranged from $5–12 per campsite per night.
2. **Managed sites without fees:** These sites are managed through partnership agreements or other means. Camping is free at managed recreation sites where the agreement holder has ways other than charging a fee to recover the costs of servicing the site (e.g., volunteers). At the time of the study, there were 334 managed sites without fees located across the province.
3. **User maintained sites:** Camping is free and users provide the majority of upkeep at the site. Campers are asked to respect the forest environment and pack out whatever they pack in. The ministry pumped

4 Formerly the Ministry of Forests (until January 2004).

toilets, removed hazard trees and replaced signs and other structures where necessary. Structures and access are not removed unless there are significant ongoing public safety hazards or environmental concerns. At the time of the study, there were a total of 819 user maintained sites across the province.

Despite the new partnership strategy, many of the sites managed under partnership agreements were at risk of failing. In addition, a large portion of user maintained sites appeared to be no longer safe, sanitary or environmentally sound. With further funding reductions planned for 2004/05, it became apparent that the recreation program was not sustainable.

In response to this disparity, the government's 2004 budget announced significant increases in funding and staff to maintain recreation sites. The additional funding was intended to enable the MoFR to:

1. Keep as many Forest Service recreation sites open as possible;
2. Continue to have the Province's recreation infrastructure accessible and available for use;
3. Sign more partnership agreements with local operators to manage recreation sites; and
4. Provide a basic level of service at user maintained recreation sites (e.g., ensure outhouses are pumped and hazard trees are inspected and removed).

Even with the additional funding and increase in the number of recreation staff, resources remained insufficient to adequately maintain all of the Province's forest recreation sites. The RSEEWG was faced with the task of determining where to focus limited resources, and therefore identified four specific objectives to guide this research process:

1. To assess the effectiveness of current management practices;
2. To identify any differences in the state of recreation sites in different forest regions and districts, and between different types of recreation sites (managed with fees, managed without fees, user maintained);
3. To estimate the resources and infrastructure required to restore and/or maintain recreation sites to baseline ministry standards; and
4. To adjust the ministry formula for allocating recreation funds to forest regions, if required.

The Recreation Site Effectiveness Evaluation Pilot Project was designed to provide a starting point for these four objectives – collecting baseline information about the current state of Forest Service recreation sites across British Columbia.

The intent of this document is not to address all of the objectives stated above, but is simply to report on the project's research findings to date, and provide some preliminary discussion about the implications for future maintenance and management of forest recreation sites in BC. In addition, this document will provide recommendations for improving the evaluation process, survey instruments, and study design for future projects of this kind.

## 2.0 Methods

### 2.1 *Study Design*

In order to limit the scope of this initial pilot project, the survey population was restricted to recreation sites with vehicle access and overnight camping facilities only. Recreation trails, interpretative forest sites, day-use sites, sites with enhanced facilities (e.g., cabins), and sites that are only accessible by foot, horse, ATVs/bikes, boats or float planes were not included.

Of the 1292 recreation sites across the province, a total of 1187 sites met the required criteria and were included in the sample population ($N = 1187$). A master list of these sites was generated, and a stratified simple random sampling design was used to partition the sites into a total of 18 strata ($N1$, ..., $N18$) (Table 1).

First, the population was stratified by MoFR Forest Region: 1) Coast Forest Region (CFR), 2) Northern Interior Forest Region (NIR), and 3) Southern Interior Forest Region (SIR). This division was chosen to capture effects related to differences in geography, differing approaches to site design, visitor use levels, and the interpretation and application of MoFR standards for recreation site management among the three regions. Samples were intentionally allocated disproportionately among regions in order to reflect the much larger total number of sites in the SIR (Table 2a, b).

Within each forest region, the population was further stratified by three distinct site types to account for the effects of different management strategies being used across the province: 1) managed sites with fees (MWF), 2) managed sites without fees (MWOF) and user maintained sites (UM) (Table 1).

*Table 1. Overview of the stratified simple random sampling design used to select sample sites for field evaluation*

| Region | Site Type | Site Size | Total population ($N_h$) | | Sample population ($n_h$) | | Sampling fraction (f = n/N) | ID | Sample Weight (1/f) |
|---|---|---|---|---|---|---|---|---|---|
| CFR | MWF | Large | *N*1 | 16 | *n*1 | 7 | 0.43750 | CWL | 2.28571 |
| | | Small | *N*2 | 45 | *n*2 | 8 | 0.17778 | CWS | 5.62500 |
| | MWOF | Large | *N*3 | 2 | *n*3 | 2 | 1.00000 | CWOL | 1.00000 |
| | | Small | *N*4 | 39 | *n*4 | 8 | 0.20513 | CWOS | 4.87500 |
| | UM | Large | *N*5 | 0 | *n*5 | 0 | 0.00000 | CUML | 0.00000 |
| | | Small | *N*6 | 53 | *n*6 | 5 | 0.09434 | CUMS | 10.60000 |
| NIR | MWF | Large | *N*7 | 1 | *n*7 | 1 | 1.00000 | NWL | 1.00000 |
| | | Small | *N*8 | 1 | *n*8 | 1 | 1.00000 | NWS | 1.00000 |
| | MWOF | Large | *N*9 | 4 | *n*9 | 3 | 0.75000 | NWOL | 1.33333 |
| | | Small | *N*10 | 45 | *n*10 | 7 | 0.15556 | NWOS | 6.42857 |
| | UM | Large | *N*11 | 10 | *n*11 | 4 | 0.40000 | NUML | 2.50000 |
| | | Small | *N*12 | 211 | *n*12 | 14 | 0.06635 | NUMS | 15.07143 |
| SIR | MWF | Large | *N*13 | 19 | *n*13 | 11 | 0.57895 | SWL | 1.72727 |
| | | Small | *N*14 | 58 | *n*14 | 10 | 0.17241 | SWS | 5.80000 |
| | MWOF | Large | *N*15 | 9 | *n*15 | 8 | 0.88889 | SWOL | 1.12500 |
| | | Small | *N*16 | 199 | *n*16 | 8 | 0.04020 | SWOS | 24.87500 |
| | UM | Large | *N*17 | 11 | *n*17 | 9 | 0.81818 | SUML | 1.22222 |
| | | Small | *N*18 | 464 | *n*18 | 14 | 0.03017 | SUMS | 33.14286 |
| **ALL SITES** | | | ***N*** | **1187** | ***n*** | **120** | | | |

*Table 2a. Overview of how survey population (N = 1187) was partitioned with respect to the two upper level stratification variables in the sampling design: 1) MoFR forest regions, and 2) site type. Data are expressed as a total number of sites.*

| | Site type | | | |
|---|---|---|---|---|
| Region | MWF | MWOF | UM | Total # of sites |
| CFR | 61 | 41 | 53 | 155 |
| NIR | 2 | 49 | 221 | 272 |
| SIR | 77 | 208 | 475 | 760 |
| **Total # of sites** | **140** | **298** | **749** | **1187** |

*Table 2b. Overview of how sample sites (n = 120) were allocated among the two upper level stratification variables identified in the study design: 1) MoFR forest regions, and 2) site type. Data are expressed as a total number of sites.*

| | Site type | | | |
|---|---|---|---|---|
| Region | MWF | MWOF | UM | Total # of sites |
| CFR | 15 | 10 | 5 | 30 |
| NIR | 2 | 10 | 18 | 30 |
| SIR | 21 | 16 | 23 | 60 |
| **Total # of sites** | **38** | **36** | **46** | **120** |

The final stratification variable was a two-level size category for each site: sites with < 20 vehicle units (small), and sites with > 20 vehicle units (large) (Table 1). Unfortunately, the Recreation Site Effectiveness Evaluation Working Group (RSEEWG) did not provide a clear hypothesis or discussion about the potential effects of site size on the data being considered. As such, analyses in this report do not discuss the effects of site size, and data have been pooled to capture the effects of either forest region or site type in all cases (Table 2a, b).

A master list placing all sites within each of the 18 strata was generated. Initially, equal numbers of sites were to be randomly selected from each of the 18 strata ($n1$, ..., $n18$) to obtain a total of 120 sample sites ($n = 120$) for field evaluation (Table 1; Appendix 2). This was modified during the planning stages due to low numbers of sites in some strata (Table 1), and sample sizes were increased in the SIR due to the large number of sites in that region.

In practice, there was some deviation from the original study design as a result of three factors. First, some sites that had been identified for sampling were misclassified in the database from which the master list was originally generated. When this fact was discovered in the field, these sites were allocated to the proper stratum by field staff (Appendix 3).[5] Similarly, some sites did not actually meet the sampling criteria (i.e., recreation sites with vehicle access and overnight camping) and were discarded from the sample population. Finally, some sites that had been selected for sampling were found to be either inaccessible due to snow conditions or other access barriers and could not be sampled.

In the latter two cases, an attempt was made to select another site from within the same stratum where possible. If there were no more sites to choose from within that particular stratum, an acceptable alternative was to select a site of the same site type within the same region.[6]

Sample weights were calculated for each stratum, and were used to calculate population estimates for all data from sample values collected in the field. All reported confidence intervals are based on 95% level of confidence. Formulas for all calculations are explained in detail in Appendix 2.

5 For example, five sites were added to the CWOS stratum (Table 1) for a total of eight sample sites where there were originally only three (Appendix 3).

6 As a result of these combined complications, the final number of sample sites within each stratum varies considerably, and may not be sufficient to fully capture the benefits of stratified random sampling.

## 2.2 *Field Evaluation Survey*

A detailed Recreation Site Evaluation Field Form was developed by the RSEEWG for field data collection (Appendix 1). The field form served two purposes: 1) to gather information directly relevant to the primary research question; and 2) to gather detailed inventory information for operational and immediate site management purposes.

The design of the field form was an iterative process completed throughout the summer and fall of 2004. Input from experts, recreation program staff and recreation stakeholders[7] was considered in the design of the form, and feedback from site evaluators was integral to improving the ease of use in the field.

More general, site-level information was collected in *Part A – Initial Site Overview. Part B – Trails, Shoreline, Facilities/ Structures, and Site Design* focused on gathering specific details about the type and condition of various site-level facilities (e.g., boat launches, traffic barriers, trails). Appendices 1–3 collect additional information about individual structural units on the site (i.e., toilets, kiosks, signage, campsites, tables and fire rings).

## 2.3 *Data Collection and Processing*

Field data were collected between September and December 2004 by regional and district MoFR staff. Regional staff members received detailed training on the field evaluation process and use of the field form, and were responsible for the subsequent instruction of district staff.

In the field, staff discovered that a number of sites were misclassified, and did not meet the required criteria for inclusion in the sample population (i.e., vehicle access and overnight camping facilities). In these cases, or where a site was inaccessible, the next site on the master list, preferably within the same stratum, was selected for evaluation (Hull 2005).

7 Feedback from recreation stakeholders was collected during a stakeholder meeting, the details of which can be found in Hull (2005). Stakeholders included representatives from the following organizations: MoFR Executive, Forest Practices Branch, MoFR regional offices, MoFR districts, BC Ministry of Water, Land and Air Protection (now Ministry of Environment), BC Ministry of Sustainable Resource Management (now defunct), Tourism BC, BC Wildlife Federation, Outdoor Recreation Council of BC, the academic community, the Okanagan Regional District, and the Upper Similkameen Indian Band.

Field data were entered into an MS Access database that was designed to look identical to the field form. Database files were exported into Excel spreadsheets for analysis purposes.

Data editing occurred during and after data entry. First, checks and editing or logic rules (i.e., validity, consistency and distribution checks) were applied to the data to identify missing, invalid or inconsistent entries that pointed to data records that were potentially in error (Hull 2005). This process helped to identify non-sampling errors arising from measurement errors, non-response and processing. Next, the process of imputation[8] was applied to determine and assign replacement values in the event of missing, invalid or inconsistent data (Statistics Canada 2003). The Project Manager assisted with this process by using professional judgement, memory recall, and observation of patterns in the data to change some of the responses and missing values. The result of this effort was a relatively "clean" dataset with plausible, internally consistent records (Hull 2005).

## 2.4 *Data Analysis*

In order to facilitate data analysis, a subset of survey questions and associated results were categorised into five focus areas, and five secondary research questions were identified:[9]

1. Site Safety
   Are recreation sites safe?
2. Sanitation
   Are recreation sites sanitary?
3. Facilities and Maintenance
   Are recreation sites meeting the ministry's baseline standards for facilities and maintenance?
4. Environmental Quality
   Are recreation sites posing risks to environmental quality?
5. Site Design
   Are recreation sites meeting the ministry's baseline standards for site design?

The recreation site evaluation included a number of questions that were specifically designed to obtain information about individual sites for operational purposes, and did not directly address the primary research question. As such, Appendix 4 provides a detailed breakdown of the subset of questions that were relevant to this pilot study, and were therefore selected for analysis.

Responses were tabulated using MS Excel pivot tables. Sample results were weighted using the sample weights for each stratum to obtain population estimates of proportions or totals for each response or characteristic, and variances were calculated for a select subset of questions (Table 1; Appendix 2).

The vast majority of the results presented in this report are expressed as estimated proportions (%) of the total population, either actual number of sites ($N = 1187$) or estimated total number of elements ($\hat{X}$) that possess the characteristic being evaluated. In some cases, particularly for questions related to the condition or number of site facilities, actual numbers of units having a certain characteristic are provided.

8 *Imputation* is the substitution of some value for a missing data point or a missing component of a data point. Once all missing values have been imputed, the dataset can then be analysed using standard techniques for complete data.

9 Adapted from Hull (2005).

## 3.0 Results

### 3.1 *Site Safety*

The safety of visitors is a focal concern for the recreation program. This pilot study evaluated safety risks associated with potential on-site natural hazards, the proximity of sites to unstable terrain, and the condition of a number of individual campsite facilities, including the campsites themselves.

#### 3.1.1 Natural Hazards

The ministry is responsible for ensuring that recreation sites are established in safe locations, as well as informing visitors about any known significant safety hazards that exist on-site. Major natural hazards should be either a) clearly identified or b) closed to visitors (Ministry of Forests 2004). For the purposes of this study, several "natural hazards" were considered: cliffs, waterfalls, rogue waves, unstable banks, and avalanche chutes.

Hazard trees pose an additional threat to the safety of visitors. Current policy requires that hazard tree assessments be completed on a routine basis. If a tree is found to be of considerable threat to visitors, it should initially be clearly identified and ultimately removed from the site. Several questions on the evaluation form were designed to assess whether full hazard tree assessments were being completed frequently enough, and once completed, whether identified hazard trees were being removed from sites in a timely fashion. Results are summarized in Table 3.

Although natural hazards were not common, being present on only 7.5% of sites across the province, the vast majority were poorly identified (75.1% of sites). Of the three site types, MWF sites performed considerably better than the others, with only 24.6% of hazards being poorly identified versus 87.5% and 100% of those on MWOF and UM sites, respectively. Among forest regions, the Northern Interior had the most significant problem with poor identification of all on-site hazards identified in the study (100%).

***Table 3.*** *Summary of the status of natural hazards on recreation sites across the province. Data have been pooled to compare results between a) site types and b) MoFR forest regions. Data are expressed as an estimated proportion of all recreation sites across the population (N = 1187). Bolded values represent the highest value for a particular characteristic among either a) site types or b) regions.*

| | | Proportion of Recreation Sites (%) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Site type | | | Region | | | |
| Q | Description of characteristic | MWF | MWOF | UM | CFR | NIR | SIR | All sites |
| 4.1 | Natural Hazards Present | **16.3** | 13.1 | 3.6 | **20.4** | 5.5 | 5.6 | 7.5 |
| 4.1 | *Of the sites where they are present only*, natural hazards are not clearly identified | 24.6 | 87.5 | **100** | 66.8 | **100** | 72.5 | 75.1 |
| 4.2 | Sites located on unstable ground or have unstable slopes above or below the site | **4.0** | 2.0 | 0 | **6.8** | 0 | 0.1 | 1.0 |
| 4.3 | *Of the sites where Past Wildlife Danger Tree Hazard Assessments have been completed only*, recommendations have not been carried out | 23.0 | 55.8 | **60.9** | 19.8 | 51.0 | **60.9** | 53.2 |
| 4.4 | Presence of hazardous trees that require a full hazard tree evaluation | 61.7 | 63.2 | **71.6** | **71.8** | 60.4 | 70.5 | 68.3 |

In addition, of the many pending recommendations from past wildlife danger tree hazard assessments across the province, 53.2% had not been carried out. Site management appears to be a significant factor, with MWF sites having notably fewer incomplete recommendations (23.0%). Also notable is the comparably low proportion of incomplete hazard assessments in the CFR (19.8%) compared to the two interior forest regions (Table 3).

Furthermore, new hazardous trees requiring a full hazard tree evaluation were found consistently across site types and forest regions, and are present on an estimated 68.3% of recreation sites across the province. In combination with the high number of incomplete recommendations from past assessments, hazard trees represent a clear threat to site safety that may require a significant investment of resources to mitigate.

In general, no consistent trends were evident among forest regions, but the results outlined in Table 3 suggest that a lack of routine maintenance may be affecting site safety. UM sites consistently performed the worst with respect to hazard identification and minimizing risks associated with the presence of hazard trees. User maintenance appears to be limited in terms of ensuring the safety of visitors, and some additional resources devoted to mitigating safety risks may be required on a routine basis.

### 3.1.2 *Safety of Campsite Facilities*

Several campsite facilities were evaluated to determine whether they were considered safe to use by visitors, including: toilets, footbridges, fire rings, campsites and tables (Figure 1a, b; Table 4). The data suggest that recreation facilities were generally fairly safe across the province. Fire rings were the most problematic with 14.4 ± 5.9% of units being classified as unsafe, and 8.3 ± 14.7% of footbridges, 6.1 ± 5.9% of toilets, 8.1 ± 3.8% of tables, and only 1.8 ± 1.6% of campsites considered unsafe to use across all sites.

A clear trend emerged among site types, however, once again pointing to the potential impact of differences in site management and maintenance on site safety. For all facilities except footbridges, MWOF sites consistently had the highest proportion of unsafe facilities and more unsafe facilities than the provincial average. Facilities on MWF sites were clearly the "safest," with the least unsafe facilities across site types in all cases, and numbers well below the provincial average.

Very few footbridges were evaluated across the province ($n = 18$; $\hat{X} = 70$), and nearly all footbridges that were evaluated were located in the CFR, and/or found on MWF sites. Close to a third of footbridges (31%) in the SIR were found to be unsafe, and a comparably high number of unsafe footbridges were found on MWF sites (16%) compared to other regions and site types where no unsafe footbridges were noted.

## *Are recreation sites safe?*

No specific thresholds or indicators defining the characteristics of a "safe" recreation site existed or were developed for this pilot study, so responding to this question in absolute terms was difficult. Furthermore, field staff was given minimal criteria with which to determine whether a particular site facility (e.g., toilets, fire rings, etc.) was "unsafe" or not, so the above results represent a relatively subjective assessment, and should be interpreted with this limitation in mind.

The preliminary evidence from this pilot project does suggest that the safety of specific facilities is not a major area of concern, and that sites have been located in safe locations with few threats due to terrain instability or other natural hazards. MWOF sites appear to have the most serious problems associated with the safety of site facilities.

Conversely, hazard identification and the presence of hazard trees appears to be problematic across all site types, and on UM sites in particular. Depending on the hazard or hazard tree in question, the associated risk will vary, and further assessment will be needed to determine where resources should be focused at the individual site level.

At the provincial level, the data indicates that substantial resources may be required across all sites in the short-term to bring sites up to acceptable safety standards where hazard identification and hazard trees are concerned. In the long-term, the recreation program may need to direct resources specifically towards ensuring that hazard trees are removed regularly and in a timely fashion, particularly on UM sites where routine maintenance is limited.

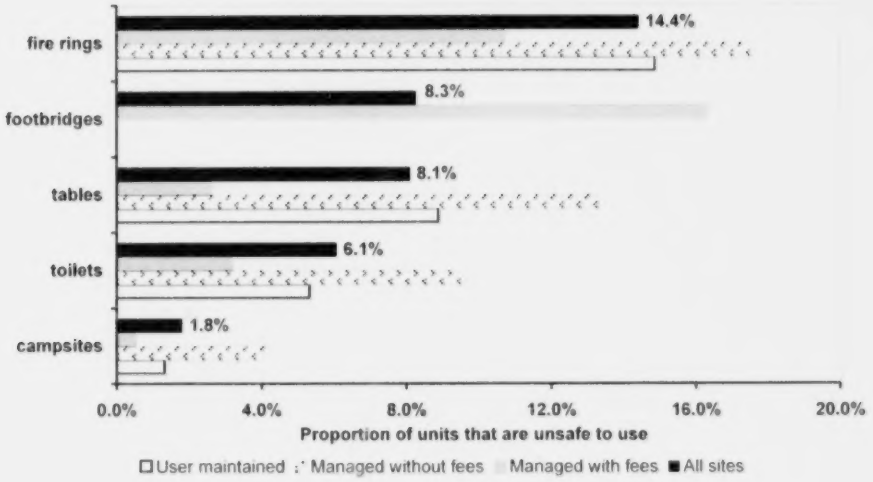



***Figure 1a.*** *Estimated proportions of facilities, pooled by SITE TYPE, that are unsafe to use across the province.*[10]

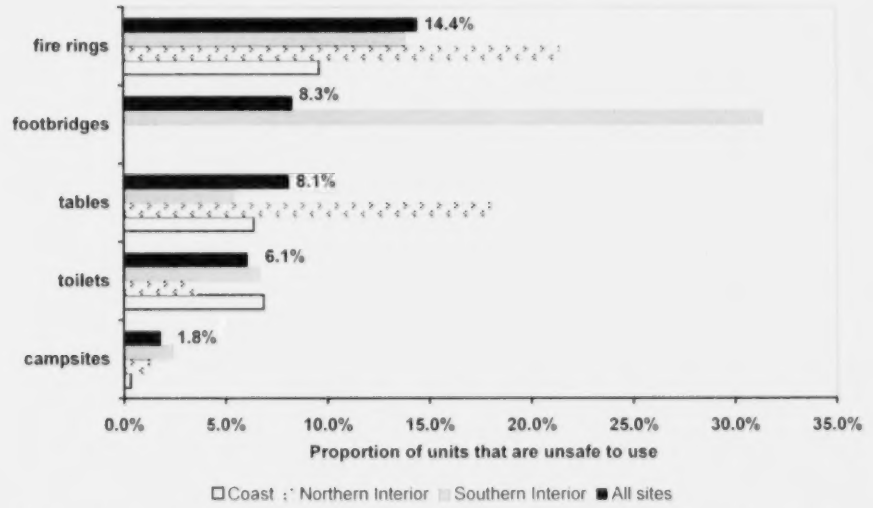



***Figure 1b.*** *Estimated proportions of facilities, pooled by FOREST REGION identified as unsafe to use across the province.*[10]

10 Both the total number of units and number of unsafe facilities were estimated for each stratum using sample weights (Table 1).

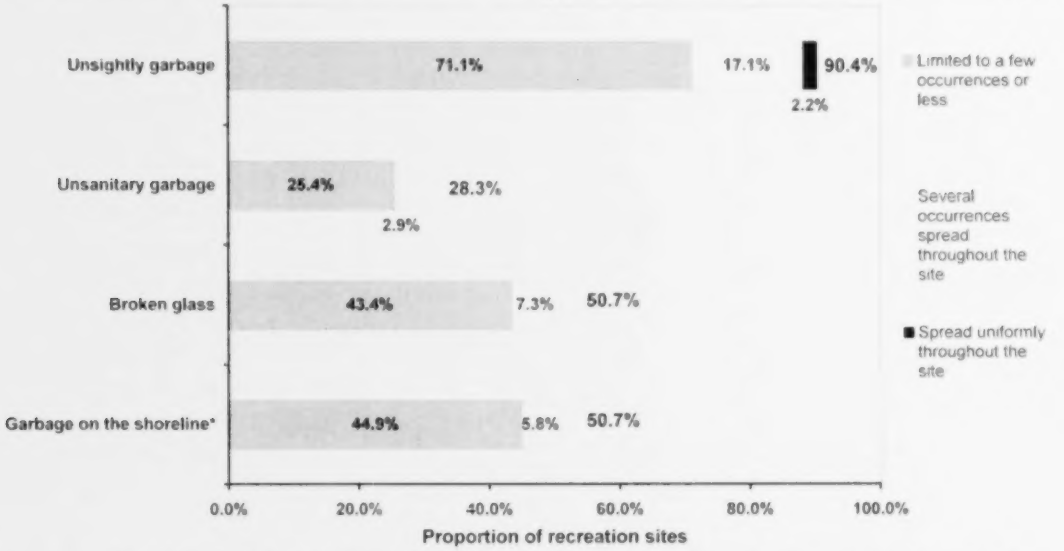
## 3.2 *Sanitation*

In addition to providing a safe recreation experience for visitors, the MoFR is committed to ensuring that facilities are kept clean and sanitary, providing a healthy environment for visitors to enjoy (Ministry of Forests 2004). In order to assess whether standards are being maintained, the pilot project evaluated the presence and abundance of various kinds of on-site garbage and non-garbage waste (e.g., faecal matter, hazardous materials, etc.), and did a thorough assessment of the condition of individual toilets.

### 3.2.1 Garbage

The presence and abundance of garbage was evaluated both in general terms (i.e., "unsightly garbage"), and in more detail identifying the presence of either "unsanitary garbage" (e.g., diapers, animal remains, used toilet paper, etc.) or "broken glass" – both of which could pose more serious health hazards (Figure 2; Table 4).

Unsightly garbage was present on the vast majority of sites (90.4%), but in most cases (71.1%), distribution of garbage on the site was limited to a few instances or less. On 17.0%




*Results were calculated for only those sites with a shoreline using combined ratio estimators (see Appendix 2 for details).

***Figure 2.*** *Pooled estimates of the proportion of recreation sites across the province with the presence of various types of garbage. No variances were calculated for questions pertaining to garbage.*[11]

***Table 4.*** *Estimated proportion of sites across the province with various types of garbage pooled by a) site type and b) MoFR forest region. Bolded values represent the highest value for a particular characteristic among either a) site types or b) regions.*

| | | Proportion of Recreation Sites (%) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Site type | | | Region | | | |
| Q | Description | MWF | MWOF | UM | CFR | NIR | SIR | All sites |
| **3.6** | Unsightly garbage on the site | 79.8 | 72.4 | **99.5** | 79.2 | **92.4** | 91.9 | 90.4 |
| **3.7** | Unsanitary garbage on the site | 21.3 | 13.7 | **35.5** | 30.9 | 14.4 | **32.8** | 28.3 |
| **3.8** | Broken glass on the site | **61.3** | 27.6 | 57.9 | **64.6** | 22.1 | 58.1 | 50.7 |
| **5.13** | Garbage present on the shoreline area | **62.6** | 36.0 | 53.8 | **69.3** | 47.1 | 48.2 | 50.7 |

11 For this and all other survey questions where distributions are described, "Reference 5 – Distribution Code Chart" (Appendix 1, p. 17) was used to categorize distribution on a given recreation site. See Appendix 4 (column = "data type") for a detailed explanation of how codes were pooled.

of sites, the problem was more widespread with several occurrences of garbage found throughout the site, and in 2.2% of cases, garbage was spread uniformly throughout the site (Figure 2). Unsightly garbage was a significant problem across site types and forest regions, particularly on UM sites where almost all sites had evidence of unsightly garbage (99.5%).

Unsanitary garbage, arguably a more pertinent issue with regards to health risks and poor sanitation than other types of refuse, was found on almost a third of all sites (28.3%). Again, distribution was sparse where it was found, and was limited to a few occurrences or less in most cases (25.4%). UM sites again had the highest incidence of unsanitary waste (35.5%) compared to other site types. Across regions, over 30% of sites had unsanitary garbage present in the CFR and SIR, while the NIR had considerably less of a problem at 14.4%.

Broken glass was present on over half of the sites (50.7%), but was largely contained to a few incidences or less. Where present, broken glass poses a health and safety risk to visitors, particularly in the summer months when users are more likely to be wearing open-toed shoes or no footwear (Figure 2). MWOF sites performed considerably better than the other two site types in this regard, as did the NIR compared to other regions; in both cases the proportion of sites where broken glass was found were less than the provincial average.

No distinction was made between unsanitary and unsightly garbage on the shoreline, but results indicated that garbage is present in some form on roughly half of sites with a shoreline (50.7%). Again, distribution was largely limited to a few occurrences or less, although if the garbage is unsanitary in nature, it could pose a disproportionately higher risk to visitors due to its proximity to a potential water source and/or swimming areas.

In general, MWOF sites had the fewest occurrences of all types of garbage. UM sites consistently performed the worst, with results above the provincial average for all types of garbage (Table 4). No consistent trends emerged between forest regions.

### 3.2.2 Dangerous Waste

The presence and distribution of various other types of waste were also evaluated, including: a) human and domestic animal faecal matter, b) hazardous waste (e.g., motor oil, paint, gasoline, etc.), and c) evidence of grey water disposal outside of designated facilities (Figure 3, Table 5). All represent a direct and potentially serious health risk to visitors, and a potentially serious risk to water quality in and around the site.

Although potable water is not provided at recreation sites, users often rely on nearby lakes, rivers or streams to obtain drinking water. Although most people treat their water in various ways before drinking it (i.e., boiling, purification tablets, filtering), others consume untreated water directly from the source. Furthermore, visitors may also be using lakes and other waterways for swimming or other recreation activities. As such, all of the above contaminants potentially present a serious threat to human health if found near or around local water sources. Contaminants present in human and animal faeces pose the greatest danger to public health, and particular concern should be paid to any presence of faecal matter on recreation sites.

Over half of the sites across the province had human or domestic animal waste present on site (55.3%). Although it was largely limited to a few occurrences or less, in 6.4% of cases, the waste was spread uniformly throughout the site (Figure 3). Furthermore, the 6.7% that was identified as human waste implies that visitors are not consistently using on-site toilet facilities, which could be linked to the state of toilet facilities (see section 3.2.3). Given the serious risks outlined above, this situation should be a major concern to recreation managers, especially where waste is spread throughout the site.

UM sites consistently had the most frequent presence of almost all kinds of waste – more than the provincial average in all cases (Table 5). When human waste was considered separately, however, it was more frequently found on MWOF sites (9.3%). Of serious concern is the fact that the vast majority (81.9%) of UM sites had at least some presence of domestic animal and/or human waste.

Across the regions, the SIR had the most severe waste problem when animal and human waste was considered together (69.1% of sites). When human waste was considered separately, the CFR emerged as having by far the most severe problem (23.5%) (Table 5).

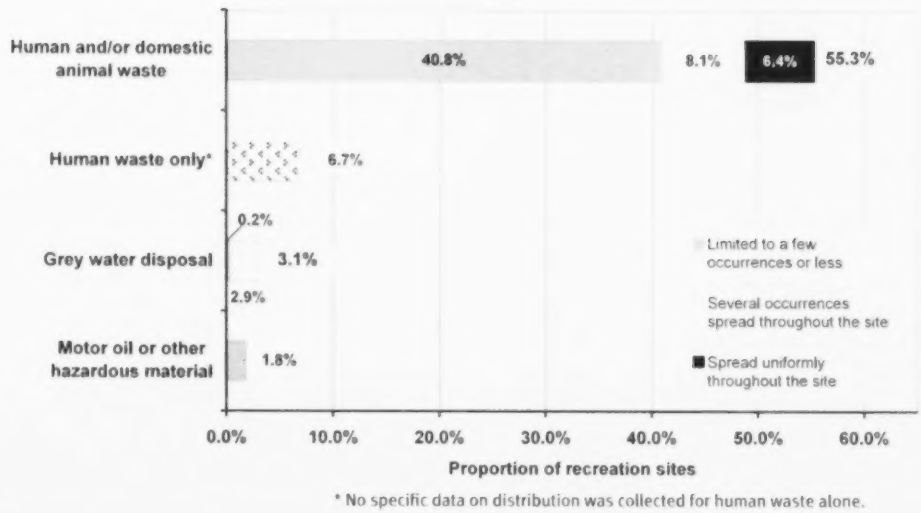



***Figure 3.*** *Estimates of the distribution of dangerous wastes as a proportion (%) of recreation sites across the province.*

***Table 5.*** *Description of human and/or domestic animal waste expressed as a proportion (%) of recreation sites. Bolded values represent the highest value for a particular characteristic among either a) site types or b) regions.*

| | Site type (%) | | | Region (%) | | | |
|---|---|---|---|---|---|---|---|
| | MWF | MWOF | UM | CFR | NIR | SIR | All sites |
| Proportion of sites with human/domestic animal waste outside of toilet facilities | 40.9 | 16.6 | **81.9** | 43.9 | 23.2 | **69.1** | 55.3 |
| Proportion of sites with presence of human waste | **9.3** | 7.4 | 6.0 | **23.5** | 2.4 | 4.9 | 6.7 |
| Proportion of sites with presence of motor oil or other hazardous waste | 0.0 | **2.0** | **2.0** | 3.1 | **5.5** | 0.1 | 1.8 |
| Proportion of sites with grey water disposal present | 1.2 | 0.4 | **4.6** | 0.0 | 0.0 | **5.0** | 3.1 |

Very few sites had evidence of improper grey water disposal outside of designated sites – 3.1% across the province. However, the Recreation Site Effectiveness Evaluation Working Group notes that this question could have produced inaccurate results because most recreation sites do not have designated grey water facilities (Hull 2005).

Similarly, the presence of hazardous materials was minimal and noted on only 1.8% of sites across the province, primarily contained to the SIR and UM sites.

### 3.2.3 Toilets

Several survey questions looked specifically at the condition of on-site toilet facilities. Sanitary toilet facilities are crucial for preventing the spread of bacteria and disease, and are also crucial to ensure that users use appropriate facilities and not adjacent public spaces for toilets (see section 3.2.2). Results are presented in Figure 4.

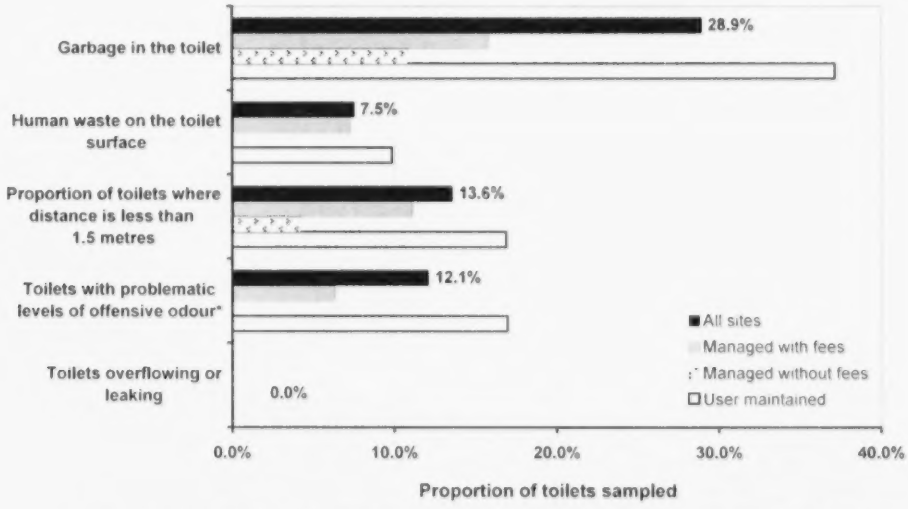
Overall, UM sites consistently performed the worst with proportions higher than the provincial average in all categories, suggesting that inadequate maintenance is clearly a problem. MWOF sites consistently had the smallest proportion of problem toilets, while MWF sites hovered around the provincial averages.

No toilets were found to be overflowing or leaking, but in 13.6% of cases, the distance between human waste and the toilet seat was less than 1.5 m, suggesting that a problem has the potential to develop in the near future (Figure 4).

In 7.5% of toilets, human waste was found on the toilet surface, posing a direct health risk to visitors through potential exposure to disease and pathogens – a serious health and management concern. Again, inadequate maintenance is a likely culprit with UM sites performing the worst, although poor visitor use practices are likely contributing to the problem. Visitor education regarding hygiene risks could encourage proper use of site facilities.

The presence of garbage in 28.9% of toilets suggests that any existing pressure on limited holding capacity is being exacerbated by poor visitor use practices, particularly at UM sites where the problem is the most severe. An educational campaign and/or fine system may be needed to ensure that no-trace camping principles are being observed by visitors in order to alleviate costly management burdens associated with the removal of trash from toilet facilities, especially on UM sites where routine maintenance is limited.

Approximately 12.1% of toilets had a problematic offensive odour. In addition to inadequate maintenance, poor facility design may be responsible. Managers may want to consider newer design technology (e.g., composting toilets) when facilities are replaced in the future, if economically feasible. Although these conditions do not pose direct health risks, they do create unpleasant conditions for visitors, and could result in the use of non-designated areas within the recreation site for toilet facilities (see section 3.2.2).




* A "problematic level" of offensive odour was determined to be a rating of 4 or 5 (on a scale of 1 to 5).

***Figure 4.*** *Overview of the condition of all toilets ($\hat{X}$ = 2085) on forest recreation sites across the province pooled by site type.*

## *Are recreation sites sanitary?*

Again, without defined thresholds to assess the performance of recreation sites at the province level, it is difficult to extract a concrete answer to the above question. It does appear that direct health risks associated with a lack of sanitation are not severe. That being said, the serious public health risks associated with any exposure to human waste should not be taken lightly. There is certainly room for improvement in this regard, as human waste was found either inside or outside of toilet facilities on several sites across the province. Exposure to hazardous materials was minimal, and direct threats to aquatic environments did exist, but were not severe at the provincial scale.

On-site garbage was much more of a problem. While the magnitude of on-site garbage did not appear to be overwhelming – most of the incidences were limited to a few occurrences or less – it is certainly widespread. Not only does the presence of garbage create an unpleasant environment for visitors, discouraging them from using the sites in general, but it can also pose a health risk to visitors through exposure to disease and potential injury. Indirectly, it can also lead to an increased safety risk by attracting and habituating dangerous animals to the site (e.g., bears, cougars).

The presence of broken glass, largely the result of broken beer and liquor bottles, can cause injury to both visitors and wildlife, and can also cause damage to vehicle tires. Garbage in toilets creates a costly management burden for managers, and the data shows this to be a particular area of concern on all sites, UM sites in particular.

While inadequate maintenance is certainly a consideration that needs to be addressed, responsibility for many of these issues lies with the visitors themselves. Visitors should be practising low- or no-trace camping when in the backcountry, and such a widespread problem with improper garbage disposal indicates that a visitor education campaign may be needed to encourage proper site use by visitors. Managers may also need to assess whether adequate waste disposal facilities are being made available to visitors on those sites where the problem is most severe.

### 3.3 *Environmental Quality*

While the recreation program strives to create safe and sanitary recreation opportunities for visitors, it is also committed to encouraging recreation activities that are environmentally sound (Ministry of Forests 2004). Protecting environmental values enhances the recreation experience, and ensures that wilderness areas will be around for future generations to enjoy.

This evaluation considered site erosion, forest health, and shoreline quality as indicators of environmental quality across recreation sites. Although this assessment is not exhaustive, the study chose to look at factors that are directly affected by visitor use pressures, and can potentially be addressed by recreation managers in the future.

#### 3.3.1 Site Erosion

The impacts of erosion on environmental quality are many. If erosion, either natural or resulting from over-use, is not effectively controlled, the result will be irreversible damage to roads, trails and campsites (Cole 2004). Consequently, the usability of a site may become compromised as facilities become unstable or simply unusable by visitors.

There may be lasting effects for the surrounding ecosystem as well. Accelerated soil loss resulting from recreation use can be detrimental to terrestrial ecosystem functioning and increased soil runoff into nearby water bodies can negatively affect water quality and the effective functioning of streams and rivers (Buckley and Pannell 1990).

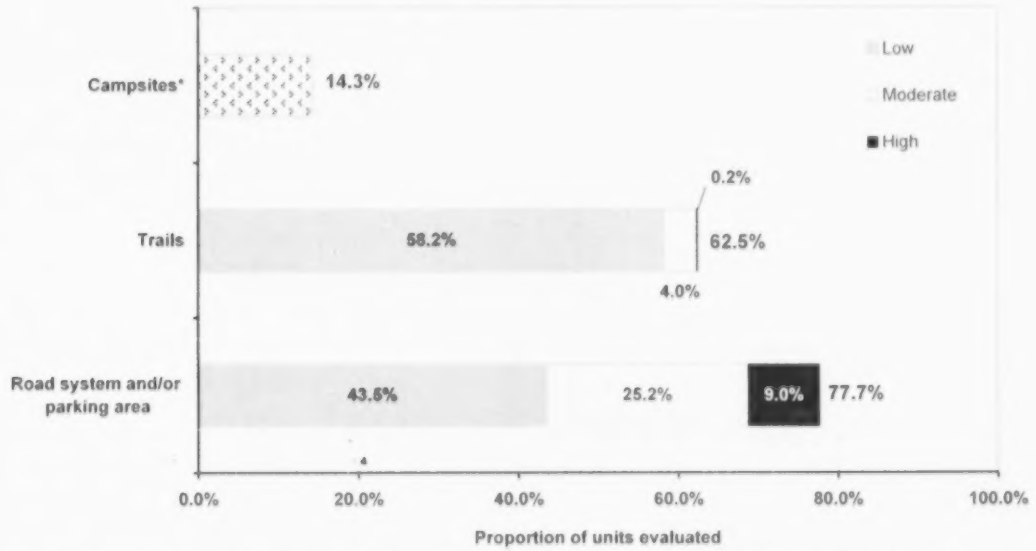
This study subjectively assessed the level of erosion on the in-site road system and parking areas, trails, and campsites to get a preliminary measure of the severity of the erosion problem on recreation sites across the province.

Erosion on the road system and/or parking area was widespread, with 77.7 ± 18.7% of sites across the province showing some level of rutting, ponding and/or erosion (Figure 5). Approximately half of the erosion was at a low level (43.5%) but 9.0% of sites had a high level of erosion. This problem is likely resulting in limited access (i.e., requiring 4WD vehicle) and/or safety hazards on those sites.

Although erosion on in-site trail systems was widespread – 62.5 ± 16.2% of trails – the severity of the problem did not appear to be a major issue, as most erosion was identified as low level (58.2%) (Figure 5).

Campsite erosion did not appear to be particularly problematic, with only 14.3 ± 9.6% of campsites showing signs of erosion (Figure 5).

Of note was the comparatively high proportion of campsites on UM sites (21.0 ± 18.8%) and the comparatively low proportion of trails in the NIR (23.4 ± 30.4%) showing signs of erosion (Table 6). The SIR consistently had a higher incidence of erosion than the provincial average, as did UM sites, implying that differences in management among regions, infrequent site maintenance, and/or differences in visitor use patterns might be resulting in increased levels of erosion. Conversely, sites in the NIR had erosion incidence well below the provincial average.




*Data on the *severity* of campsite erosion was not collected, so numbers reflect only the proportion of campsites where erosion was noted.

***Figure 5.*** *Average severity of erosion on an estimated number of campsites ($\hat{X}$ = 7980), trails ($\hat{X}$ = 747) and road systems/parking areas (N = 1187) across the province.*

***Table 6.*** *Comparison of erosion on trails, campsites and road systems/parking areas across the province pooled by site type and region. Bolded values represent the highest value for a particular characteristic among either a) site types or b) regions.*

| | Proportion of recreation sites (%) | | | | | | |
|---|---|---|---|---|---|---|---|
| | Site type (%) | | | Region (%) | | | |
| | MWF | MWOF | UM | CFR | NIR | SIR | All sites |
| Road system/parking area | 61.1 | 77.5 | **80.9** | 77.2 | 60.7 | **80.2** | 77.7 |
| 95% CI (±) | 18.4 | 33.7 | 26.2 | 24.8 | 24.2 | 27.4 | 18.7 |
| Trails | 64.6 | **74.7** | 55.6 | **76.6** | 23.4 | 66.6 | 62.5 |
| 95% CI (±) | 17.4 | 23.4 | 26.0 | 15.7 | 30.4 | 20.2 | 16.2 |
| Campsites | 6.7 | 9.6 | **21.0** | 13.8 | 5.4 | **17.0** | 14.3 |
| 95% CI (±) | 4.5 | 7.6 | 18.8 | 8.0 | 5.4 | 14.6 | 9.6 |

### 3.3.2 Forest Health

The diverse forest ecosystems across BC are a defining feature of the provincial landscape, and most forest recreation sites are located in forested areas. Poor forest health can increase safety risks associated with dead or hazardous trees on-site, and can detract from the aesthetic value of a particular site. In addition, other elements of the forest ecosystem, including understory composition and structure, are critical for ensuring overall forest health and creating habitat value for various forest-dependent species.

The presence of humans, particularly in higher use areas in the Southern Interior, not only accelerates the natural erosion process (see section 3.3.1) which can lead to root exposure and damage, but introduces additional pressure as a result of direct tree vandalism. Compounding these pressures are various biological threats to forest health, including: root/heart disease, pest infestation, and the presence of invasive species. All factors can have a damaging effect on forest health to the detriment of both the visitor experience as well as site safety, with increased tree mortality leading to higher numbers of on-site hazardous trees.

#### *(a) Human Impacts*

Results indicate that tree vandalism is a major problem across all regions of the province. On average, 15.4% of trees on any given site showed signs of vandalism, and tree vandalism was noted on 89.3% of recreation sites across the province.

Tree vandalism can not only detract from the aesthetics of a site, but can threaten tree health, and may result in tree death if the vandalism is severe. This has the potential to create a safety risk to visitors if the dead tree becomes a hazard, and also threatens the long-term viability of the forest ecosystem.

Root damage was widespread across sites, with 41.3% of recreation sites across the province having some root damage, although it seemed to be restricted to a relatively small proportion of trees on any given site (4.6%) (Table 7).

Tree vandalism is clearly a problem across all regions and site types. The CFR had the highest incidence of tree vandalism, with all sites (100%) showing signs of vandalism on close to 1/5 of on-site trees. In 10% of the cases, over half of the on-site trees were vandalised. Similarly, almost all MWF sites (98.7%) had signs of vandalism on an average of 17.4% of on-site trees.

***Table 7.*** *Overview of tree vandalism and root damage on recreation sites across forest regions and site types. Numbers indicate the proportion of forested recreation sites ($\hat{X}$ = 1183) with evidence of either tree vandalism or root exposure in a given proportion of on-site trees. Bolded values represent the highest value for a particular characteristic among either a) site types or b) regions.*

| | Proportion of recreation sites (%) | | | | | | |
|---|---|---|---|---|---|---|---|
| | Site type (%) | | | Region (%) | | | |
| | MWF | MWOF | UM | CFR | NIR | SIR | All sites |
| Showing signs of **Tree Vandalism** | | | | | | | |
| 0–25% | 86.6 | 68.8 | 69.0 | 89.2 | 89.3 | 60.8 | 71.0 |
| 26–50% | 2.5 | 0.3 | 19.7 | 0.7 | 5.5 | 17.9 | 12.9 |
| › 50% | 9.7 | 12.5 | 1.9 | 10.1 | 3.3 | 5.3 | 5.5 |
| Totals | **98.7** | 81.7 | 90.6 | **100.0** | 98.1 | 84.0 | 89.3 |
| Showing signs of **Root Damage** | | | | | | | |
| 0–25% | 37.2 | 36.8 | 36.3 | 36.4 | 61.2 | 27.7 | 36.5 |
| 26–50% | 5.3 | 0.4 | 4.4 | 3.7 | 0.0 | 4.7 | 3.5 |
| › 50% | 0.0 | 1.6 | 1.4 | 10.1 | 0.0 | 0.0 | 1.3 |
| Totals | **42.6** | 38.8 | 42.1 | 50.2 | **61.2** | 32.4 | 41.3 |
| **Average proportion of trees on an individual recreation site (%)** | | | | | | | |
| Showing signs of tree vandalism | 17.8 | 16.4 | **14.5** | **19.4** | 11.7 | 15.8 | 15.4 |
| Showing evidence of root rot | 4.3 | 4.5 | **4.7** | **10.7** | 3.5 | 3.8 | 4.6 |

Root damage appears to be less severe of a problem. Approximately 41.3% of sites across the province showed signs of root damage, most of which was concentrated in the NIR. Across site types, no clear trend emerged.

Because severe root damage can eventually kill a tree either through direct damage, or by making roots susceptible to root disease, it is a direct risk to forest health. Furthermore, it may also create instability at the base of the tree, creating a hazard tree that will need to be removed.

### *(b) Invasive Species*

Invasive species are a widespread problem across BC (Klinkenberg 2006). Typically, exotic or non-native plants and/or pathogens have been introduced to this province without their natural predators. Left unchecked, these invasive plants have the capacity to move into a habitat, reproduce aggressively, and displace the original vegetation, making them among the top causes for losses in the natural diversity of our environment.

The survey assessed the presence and abundance of specific invasive species on recreation sites, the intent of which was to provide baseline data for potential future forest health studies. Results are summarized in Table 8.

Results indicate that an average of close to 1/5 of recreation sites across the province had at least one invasive species present on-site (Figure 6), although the results varied considerably between regions and across site types (Table 8). Almost all invasive species appeared to be concentrated in the SIR region (62.5%), and occurrences were heavily concentrated at UM sites (94.3%).

Of all identified species, diffuse knapweed was easily the most common, but was restricted exclusively to the SIR,

***Table 8.*** *Incidences of individual invasive species on recreation sites across BC organized by site type and region. Bolded values represent the highest value for a particular characteristic among either a) site types or b) regions.*

| | Estimated total number of occurrences | | | | | | | Proportion of total occurrences (%) |
|---|---|---|---|---|---|---|---|---|
| | Site type | | | Region | | | | |
| Invasive Species | MWF | MWOF | UM | CFR | NIR | SIR | All Sites | |
| Unidentified spp. | 0 | 0 | 33 | 0 | 0 | 33 | 33 | 11.4 |
| Canada Thistle (CT) | 9 | 3 | 4 | 1 | 3 | 13 | 16 | 5.6 |
| Diffuse Knapweed (DK) | 30 | 26 | 68 | 0 | 0 | 124 | **124** | **42.7** |
| Hound's Tongue (HT) | 23 | 0 | 33 | 0 | 0 | 56 | 56 | 19.4 |
| Scotch Broom (SB) | 2 | 0 | 11 | 13 | 0 | 0 | 13 | 4.4 |
| Spotted Knapweed (SK) | 13 | 1 | 33 | 0 | 0 | 48 | 48 | 16.4 |
| All species – Totals | 14 | 3 | **273** | 78 | 30 | **181** | 290 | |
| Proportion of total occurrences (%) | 4.8 | 0.9 | **94.3** | 27.0 | 10.5 | **62.5** | | |

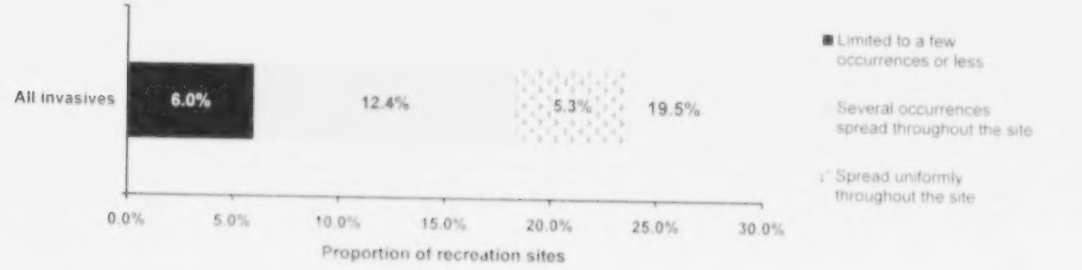



***Figure 6.*** *Overview of the spread of invasive species on BC recreation sites. Numbers are expressed as a proportion of the total number of recreation sites (N = 1187).*

and occurred mostly at UM sites. Although Scotch Broom was not originally on the species list provided to staff, several people noted its presence. There were relatively few incidences of Canada Thistle reported (Table 8).

Unfortunately, limited training was provided for the evaluation (Hull 2005). Since plant identification skills among staff were variable, it is likely that some invasive plants were misidentified or not recorded at all, so the above data are likely conservative. In most cases, only one invasive species was recorded, which may or may not be indicative of the true severity of the situation.

The invasive species problem is a complex one. Invasive species affect food sources for wildlife, can influence pollinator availability, and can crowd out native species directly, including rare and endangered species. Dramatic changes in bird populations, elk herds, reindeer herds, and other wildlife as a result of the replacement of native species and habitat by alien species are becoming evident as a result (Klinkenberg 2006). Other effects that are of concern to recreation managers include:

- can pose dangers to humans when poisonous
- can create fire hazards; large masses of tall, dry weeds along roadsides create traffic hazards; aquatic weeds pose dangers to swimmers and boaters
- provide refuge for insects and diseases that attack adjacent trees and plants
- reduce the aesthetics of an enjoyable landscape.

The MoFR is committed to controlling or eliminating noxious weeds on Crown land. The most comprehensive list of invasive species for the province of BC at the time of writing has been compiled by Meidinger et al. (2004).

#### *(c) Disease and Pest Infestations*

Presently, the rapid spread of bark beetle and other forest pest infestations is of vital concern in BC. Forest composition at both the stand and landscape level is being altered at an unprecedented rate and scale across the province, the economic and ecological implications of which are not yet fully understood.

Tree pest infestation rates on recreation sites vary greatly among forest regions, largely due to historic patterns of bark beetle spread (Figure 7; Figure 8). Across the province, 38.9% of forested recreation sites are showing evidence of pest infestation, which in almost all cases (35.9%) can be attributed to the bark beetle.

The extent of pest infestation varies considerably by region. Over half of sites in the NIR are showing signs of infestation, all as a result of bark beetle infection, compared to less than 15% of sites in the CFR with none due to bark beetle.

On any given site where a pest infestation is present, an average of 30.3% of trees is affected, with the NIR showing slightly higher infection rates at 35.8%. In other words, where it occurs, the problem of pest infestation is fairly severe.

Root disease is another major threat to forest health in BC (Davis and Machmer 1998). Although its effect is being overshadowed by the overwhelming bark beetle situation across the province, it is still affecting as many as 17.0% of forested recreation sites. Furthermore, on any given infected site, an average of 10% of trees is affected. Rates are slightly higher in the CFR at 15.3%.

Given the importance of healthy forests to the aesthetics and environmental integrity of forest recreation sites, bark beetle and other pest infestations could be a serious concern for recreation managers. Of particular concern is the potential creation of large numbers of hazard trees with a rapid increase in tree death, particularly in the NIR where bark beetle infection rates are highest (Ministry of Environment 2006, Ministry of Forests and Range 2006).

### 3.3.3 Shoreline Condition

It is important to control shoreline access in order to prevent soil and vegetation damage by people and livestock. Shoreline vegetation anchors soils and reduces erosion, which lessens risks to water quality, and also maintains the aesthetics of a site. By restricting shoreline access to boat launches and beaches to specific trails, risks to shoreline erosion and damage can be minimized (Buckley and Pannell 1990).

The presence of user-made trails can often be detrimental to shoreline stability and site aesthetics, but their impact varies considerably on a site-by-site basis and is dependent on the physical characteristics of a particular site. User-made trails in poor condition should receive appropriate remedial works to prevent further erosion.

Field staff were asked to tabulate the number of user-made trails leading to the shoreline and evaluate whether remedial action was required to ensure shoreline quality. Only those sample sites with a shoreline ($n$ = 110) were used to calculate the results in Table 9.

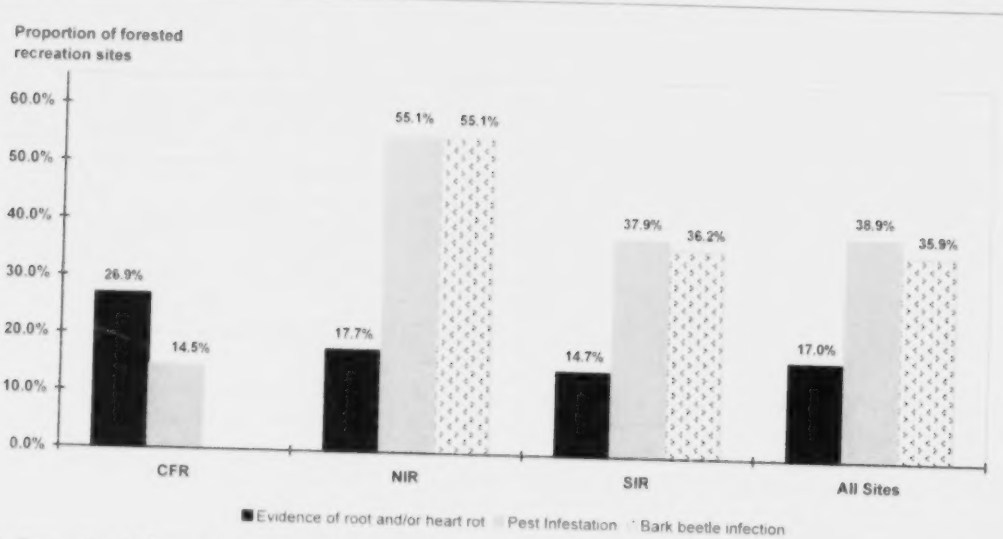



***Figure 7.*** *Proportion of forested sites showing signs of root rot and pest infestation (all pests), and proportion of infestations due to bark beetle pooled by forest region ($\hat{X} = 1183$).*

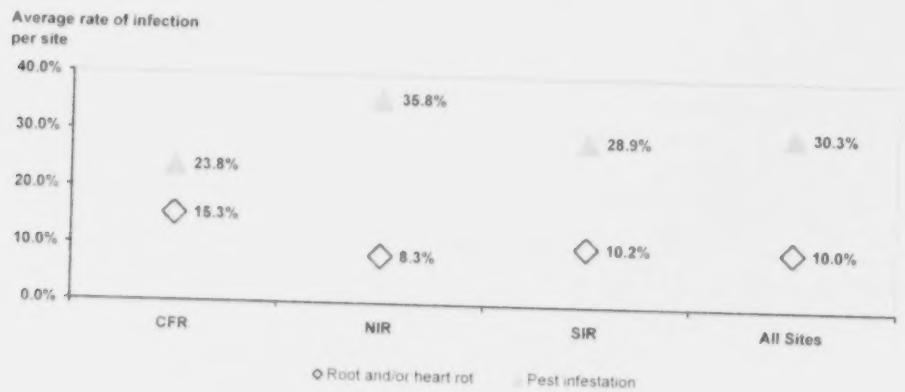



***Figure 8.*** *On infected sites only, the average proportion of trees showing signs of pest infestation or root and/or heart rot pooled by forest region.*

***Table 9.*** *Overview of trails leading to the shoreline pooled by site type and region. Values are calculated for sites with shorelines only ($\hat{X}$ = 755). Bolded values represent the highest value for a particular characteristic among either a) site types or b) regions.*

| | Proportion of recreation sites with shorelines(%) | | | | | | |
|---|---|---|---|---|---|---|---|
| | Site type | | | Region | | | |
| | MWF | MWOF | UM | CFR | NIR | SIR | All sites |
| 0–5 trails leading to the shoreline | 72.5 | 52.4 | 65.3 | 67.3 | 46.6 | 66.2 | 62.7 |
| 5–10 trails leading to the shoreline | 5.6 | 6.4 | 4.8 | 4.2 | 6.3 | 5.3 | 5.3 |
| › 10 trails leading to the shoreline | 2.2 | 0.0 | 0.2 | 0.0 | 0.5 | 0.4 | 0.4 |
| All sites with trails leading to the shoreline | **80.2** | 58.9 | 70.3 | 71.5 | 53.4 | **71.9** | 68.4 |
| Of sites with trails leading to the shoreline only, trails require remedial action | 13.0 | **22.7** | 4.6 | **33.1** | 1.8 | 7.2 | 9.8 |

Of sites with a shoreline, 68.4 % had the presence of user-made trails. Although the problem is widespread, its magnitude appears to be minimal, however, most sites have only 1–5 user made trails, and only 9.8% of sites with trails require some kind of remedial action (Table 9).

The problem is most severe on MWF sites, with over 80% of sites having user-made trails leading to the shoreline. Although the occurrence of user-made trails is lower on MWOF sites, the trails are generally in the worst shape, with close to 23% requiring remedial action (Table 9).

The NIR has a notably lower proportion of user-made trails than other regions, but still over half of all sites have these trails. Damage is clearly the most severe in the CFR where approximately 1/3 of sites with trails require remedial action, possibly due to higher visitor use pressure combined with heavier rainfall and muddier trails (Table9).

## *Are recreation sites posing risks to environmental quality?*

These preliminary data suggest that there are clearly some areas of concern with respect to environmental quality. Erosion on road systems and parking areas in the SIR, and on trails in the CFR, is a notable concern. Similarly, user-made trails are clearly an issue that requires further research to ensure that shoreline damage is controlled and threats to adjacent water bodies are minimized.

Tree vandalism is a major problem across the province. Almost all sites had evidence of tree vandalism on a relatively large proportion of on-site trees. This poses major concerns with respect to forest health, and may contribute in the near future to the creation of unmanageable rates of tree mortality and the presence of large numbers of on-site hazard trees.

Two of the largest challenges facing natural resource managers across the province are also a major concern for recreation managers: a) the spread of invasive species (Turner 2005) and b) bark beetle infestations (Ministry of Forests and Range 2006). Over 1/3 of all sites are showing signs of bark beetle infection, which will rapidly begin to alter site aesthetics and ecosystem values inherent in these wilderness areas, as well as increase the risk of tree mortality and the presence of hazard trees. This issue requires immediate attention from recreation managers, and will likely require considerable resources in the near future.

The data suggests that threats from invasive species are moderate at the moment, but because these estimates are likely conservative, the problem may be much more severe than reported here. Depending on the biology of a particular species, some could be serious threats to ecosystem health (e.g., diffuse knapweed) if left unchecked.

## 3.4 *Facilities and Maintenance*

As is evident from the previous discussion, inadequate maintenance can adversely affect all three of the aforementioned focus areas – site safety, sanitation, and environmental quality – and in order to minimize associated risks, remedial works may be required to bring site facilities up to ministry standards (see Appendix 5 for examples of standards). In some cases, remedial works are necessary simply to make the facility functional, while outright replacement may also be required where repair is either not possible or too costly.

A number of on-site facilities were evaluated to determine whether they were: a) functional or non-functional, or b) at, above or below MoFR standards[12] (Table 10).

Data regarding remedial works required to bring the facility up to MoFR standards and/or make it functional was also collected for most facilities. Results are summarized in section 3.4.1.[13]

Additional data was collected to determine how many new units are required on recreation sites across the province. Results are summarized in section 3.4.2.

***Table 10.*** *Summary of recreation site facilities assessed across the province. A sample number of units (#) or a sample length (in km) of each facility was evaluated to determine whether they were either: a) functional or non-functional, or b) at, above or below MoFR standards. Remedial works information was collected for most facilities.*

| Facility | Number of units evaluated (#) | Estimated total # of units ($\hat{X}$) | Sample length assessed (km) | Estimated total length (km) | Remedial works data |
|---|---|---|---|---|---|
| **Is the [facility] functional?** | | | | | |
| Boat launches | 104 | 880 | | | Yes |
| Docks/wharves/piers | 44 | 223 | | | Yes |
| Parking areas | 93 | 799 | | | Yes |
| Culverts | 44 | 291 | | | No |
| Ditches | | | 4.55 | 43.30 | No |
| **Is the [facility] at, above or below MoFR standards?** | | | | | |
| Tables | 1377 | 7070 | | | Yes |
| Fire rings | 1391 | 7420 | | | Yes |
| Toilets | 325 | 2085 | | | Yes |
| Kiosks | 56 | 296 | | | Yes |
| Directional signs | 217 | 1141 | | | Yes |
| Entrance signs | 126 | 1210 | | | Yes |
| Fencing | | | 5.27 | 31.68 | Yes |
| **Remedial works data only** | | | | | |
| Campsites | 1486 | 7980 | | | Yes |
| Footbridges | 22 | 70 | | | Yes |
| Roads | | | 57.37 | 3826.5 | Yes |

12 Baseline maintenance standards do not exist for all facilities (See Appendix 5). Where standards did not exist, staff were asked to evaluate whether the facility was functional or not. For future evaluations, baseline maintenance standards should be established for all facilities.

13 A major assumption adopted by the author is that the total number of units on a given site was equal to the total number of secondary elements evaluated by field staff. For example, if there were 10 toilets on a given recreation site, they were all included in the sample population ($\hat{X}$). Data for unit totals were not available at the time of writing, and therefore it was not possible to verify this assumption in all cases. In the future, sub-sampling should be done to avoid having to make this assumption.

### 3.4.1 Current Facilities

Even with additional funding and an increase in the number of recreation staff, resources are still insufficient to adequately maintain all of the Province's forest recreation sites. The RSEEWG must therefore determine where to focus these limited resources, and have identified four specific objectives to guide this research (outlined in Section 1.0 of this report). The data presented here describing the condition of recreation facilities will help managers focus their limited resources on specific problem areas, and also lead to a more effective assessment of the resources required to bring facilities up to MoFR standards.

Staff were asked to determine if a facility unit was either a) functional or non-functional (Figure 9) or b) at, above or below MoFR standards (Figure 10). For campsites, footbridges and roads, only remedial works data was collected.

Results indicate that the condition of four types of facilities may be of particular concern. Over ¼ of all docks/wharves piers (31.6 ± 29%), kiosks (34.3 ± 21.1%), fire rings (31.4 ± 9.5%), and entrance signs (26.2 ± 9.9%) were found to be non-functional or below MoFR standards (Figure 9; Figure 10). Furthermore, the vast majority of docks (85.4 ± 15.4%) require some kind of remedial works, 39.5% of which is outright removal or replacement (Figure 11). Approximately half of the kiosks (50.0 ± 23.4%) and entrance signs (48.5 ± 13.2%) across the province require remedial works of some kind. The majority of fire rings (64.4 ± 8.9%) require remedial works, with half (49.8%) requiring outright removal or replacement.

Although only 12.9 ± 3.9% of tables were found to be below MoFR standards, the majority require some kind of remedial works and 14% need to be removed or replaced. Similarly, although only 3.6 ± 5.5% of boat launches were non-functional with some requiring removal or replacement (2.0%), a large proportion (36.3 ± 13.5%) require other remedial works, most of which were considered to be major repairs (23.0%).

Directional signs appeared to be in relatively good shape with only 10.2 ± 7.9% found to be below standard, and the majority of remedial works required (31.9 ± 12.5%) were considered minor (19.1%). Similarly, only 4.6 ± 6.1% of parking areas were considered non-functional, but 35.8 ± 15.1% required remedial works, with the majority considered to be major repairs (31.2%).

Although only 13.9 ± 6.3% of toilets were below MoFR standards, 21.1 ± 8.3% require remedial works. Given the sanitation issues discussed in section 3.1, these results should be taken particularly seriously.

A very small proportion of fencing was evaluated in this study, and as a result the errors associated with the estimated total length (in km) are extremely high. Nevertheless, fencing was found to in fairly good shape, with only 8.0 ± 8.4% of the total length or 25.31 ± 26.34 km found to be below standard. Approximately 11.0 ± 8.8% of the total length or 3.5 ± 2.8 km require remedial works, with a fairly even split among the types of works required.

No remedial works data was collected for culverts, and again, a very small number of sites had culverts to evaluate so associated errors are extremely high. Results indicate that 21.4 ± 24.6% of culverts were non-functional, and one can infer that remedial works would be required.

Only remedial works data was collected for campsites, with over half requiring remedial works (55.3 ± 10.2%), the vast majority of which were considered to be major repairs (42.7%).

### 3.4.2 Road Works

The status of roads was investigated in slightly more detail given their crucial importance in providing safe site access for visitors (Figure 12; Figure 13).

Over half of the total length of in-site roads required remedial works of some kind (57.0 ± 0.8%) translating to a total of 2179.9 ± 29.8 km (Figure 13). In many cases, more than one treatment was required to bring the roads up to MoFR standards (Figure 12).

Minor repairs, including cleaning and grading of ditches and brushing, were required on 11.7 ± % (445.8 km) and 7.8% (298.8 km) of roads, respectively.

More costly repairs, including sub-grade repairs and road grading, made up a large proportion of required works – 5.5 % (208.6 km) and 40.4% (1546.2 km), respectively. Gravelling was also required on over 37.3% (1429.2 km) of roads.

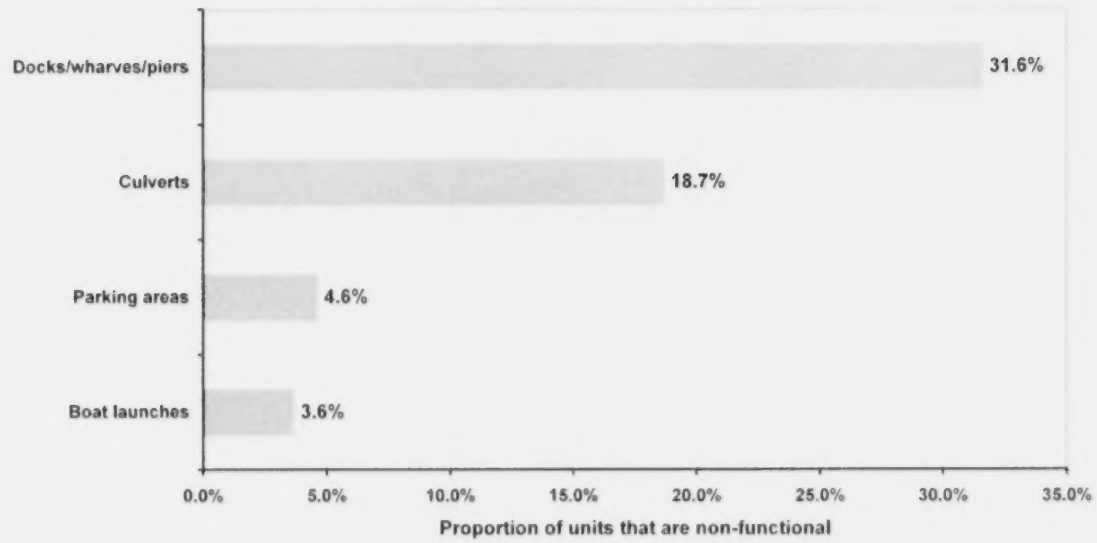



*Figure 9. Proportion of recreation site facilities that were found to be non-functional.*

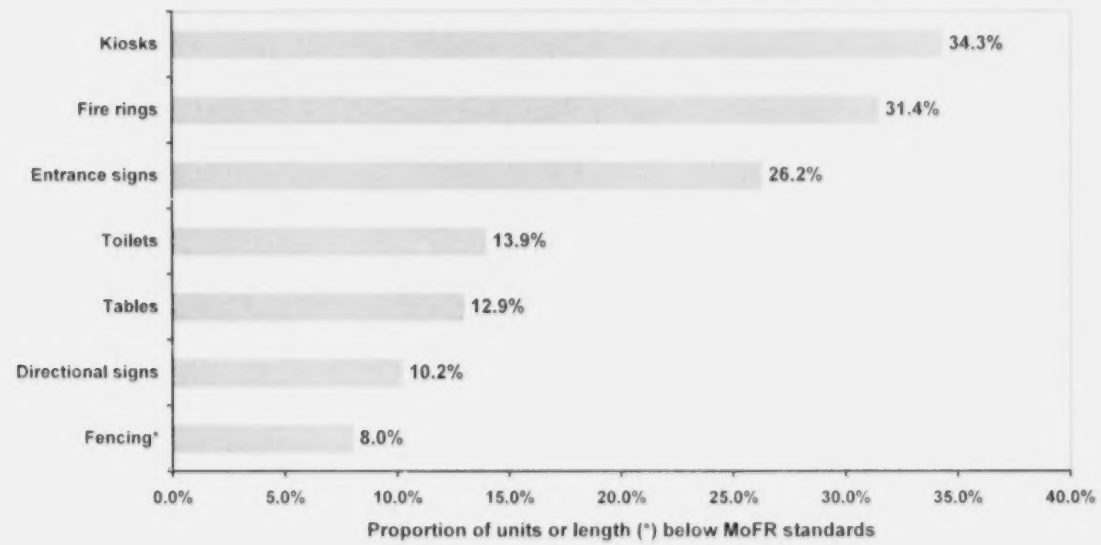



*Figure 10. Proportion of recreation site facilities that were found to be below MoFR standards.*

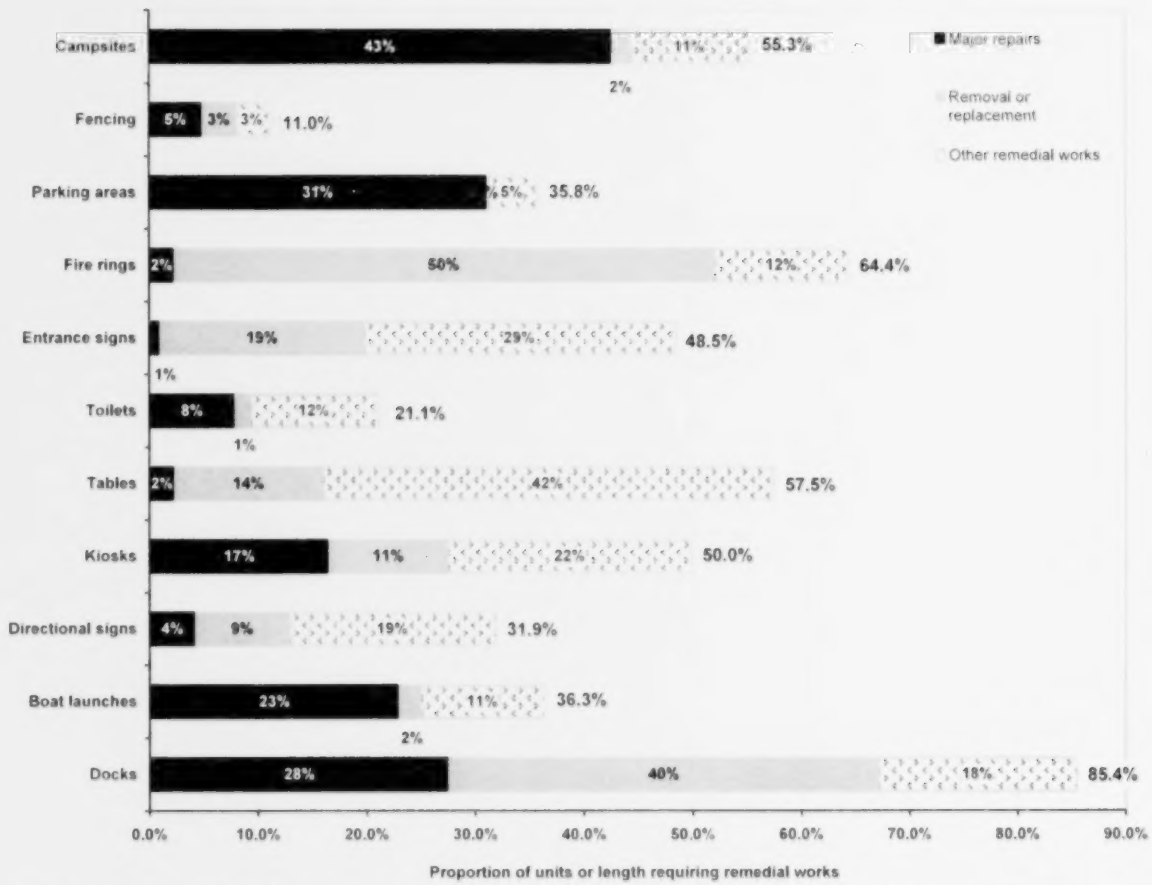



***Figure 11.*** *Proportion of MoFR recreation facilities requiring a) major repairs, b) removal or replacement, or c) other remedial works (i.e., minor repairs, painting, brushing, cleaning). Results represent either a proportion of the estimated total number of units or the estimated total length (km) of each facility that requires remedial works.*

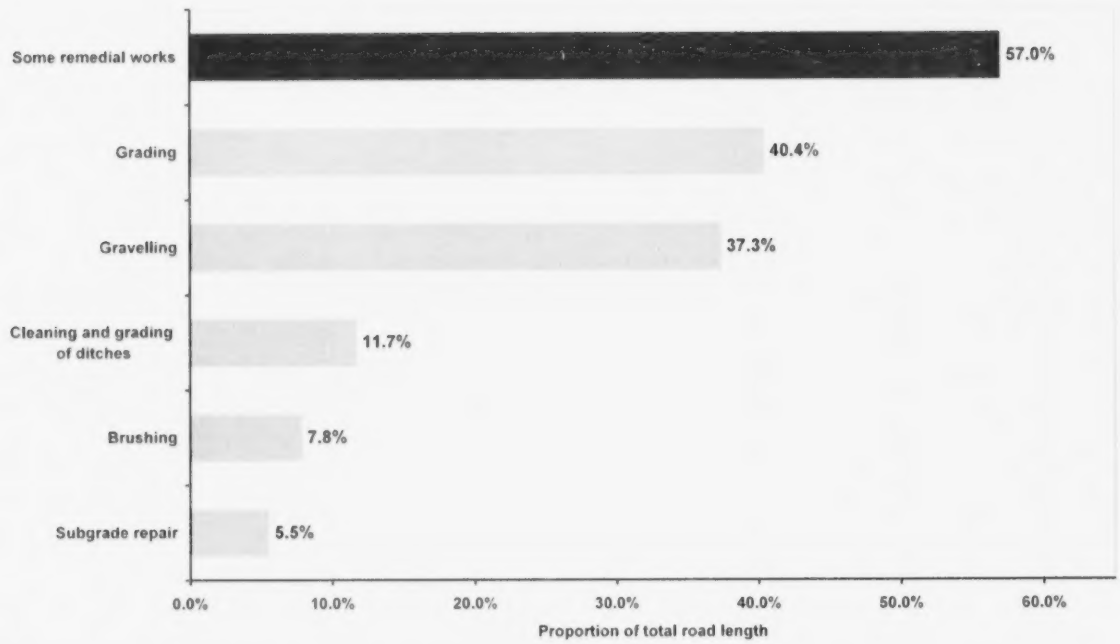



***Figure 12.*** *Overview of road works required on recreation sites across BC. Note that more than one type of remedial works may be required on the same stretch of road.*

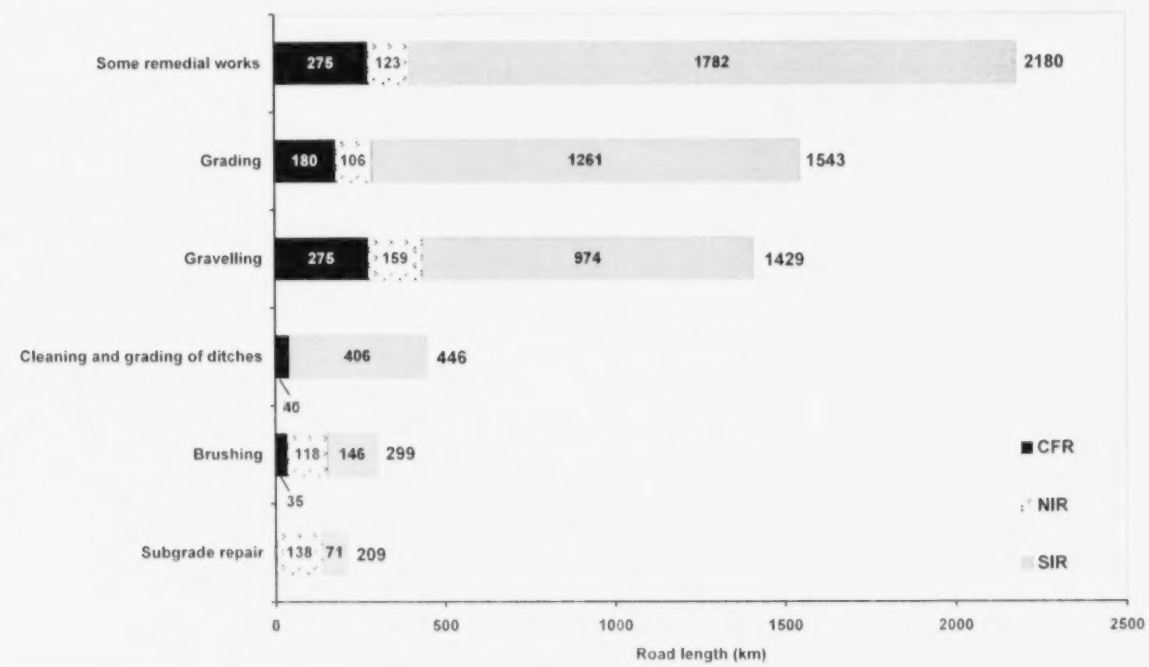



***Figure 13.*** *Total length of roads requiring remedial works pooled by MoFR region.*

### 3.4.3 Additional Facilities

For a number of facilities, the pilot study also asked staff to record whether the current number of units was meeting visitor needs. On many sites, current facilities were found to be inadequate and additional units were required. This information is summarized in Figure 14.

The additional number of directional signs and kiosks needed across the province represent the most significant increase over existing numbers (Table 11). Unfortunately, errors are very high in most cases, so the results can only be used with caution for making budget estimates.

Although not as significant an increase compared to what currently exists, the total number of tables, fire rings and campsites required to meet visitor needs is substantial, and would require significant financial resources to achieve.

## *Are managed recreation sites meeting the ministry's baseline standards for facilities and maintenance?*

Clearly, baseline standards for facilities and maintenance are not adequately being met in many cases. The state of docks/wharves/piers is particularly dire, and entrance signs, fire rings and ditches are not far behind. The condition of toilet facilities, which has implications for site sanitation and safety as well, requires substantial attention as well.

In addition to several existing facilities being non-functional or operating at below standard levels, additional units are needed to meet existing visitor needs in many cases. The most substantial increases needed are in the number of directional signs and kiosks. Arguably, by increasing the number of some facilities (e.g., toilets), some of the issues related to overuse that have been discussed in earlier sections could be alleviated.

## 3.5 *Site Design*

To assess this final focus area, staff were asked to rate the design or layout of each recreation site for consistency of design principles and the aesthetic quality of the recreation site, given site-specific user needs and the natural environment of the recreation site (see Appendix 1 for detailed criteria).

The proportion of sites with poor site design was much higher for UM sites (17.2 ± 13.8%) than other site types or the provincial average for all sites (12.5 ± 8.8%) (Figure 14). Furthermore, UM was the only site type with less than half of sites rated at either good or excellent. MWF sites had a notably high proportion of sites with excellent site design (28.4 ± 13.3%), and the fewest sites with a moderate or poor rating.

Given the nature of UM sites, where fewer resources are devoted to planning and maintenance, this is not a surprising result. The design of UM sites is largely shaped by the visitors themselves. It does suggest that active site management has an overall effect on the aesthetics and practicality of recreation site design, and may be key to ensuring that facilities meet user needs. Conversely, those people that frequent user maintained sites tend to be seeking a more remote wilderness experience, and may not be as concerned about site aesthetics.

## *Are managed recreation sites meeting the ministry's baseline standards for site design?*

Given that just under half of sites across the province were found to have either good or excellent site design (49.1%), one could argue that it is not a major area of concern. It is difficult to assess the impact of poor site design on visitor experience, however, and it is also difficult to make decisions on how to approach this issue given the number of criteria that were assessed (Appendix 1).

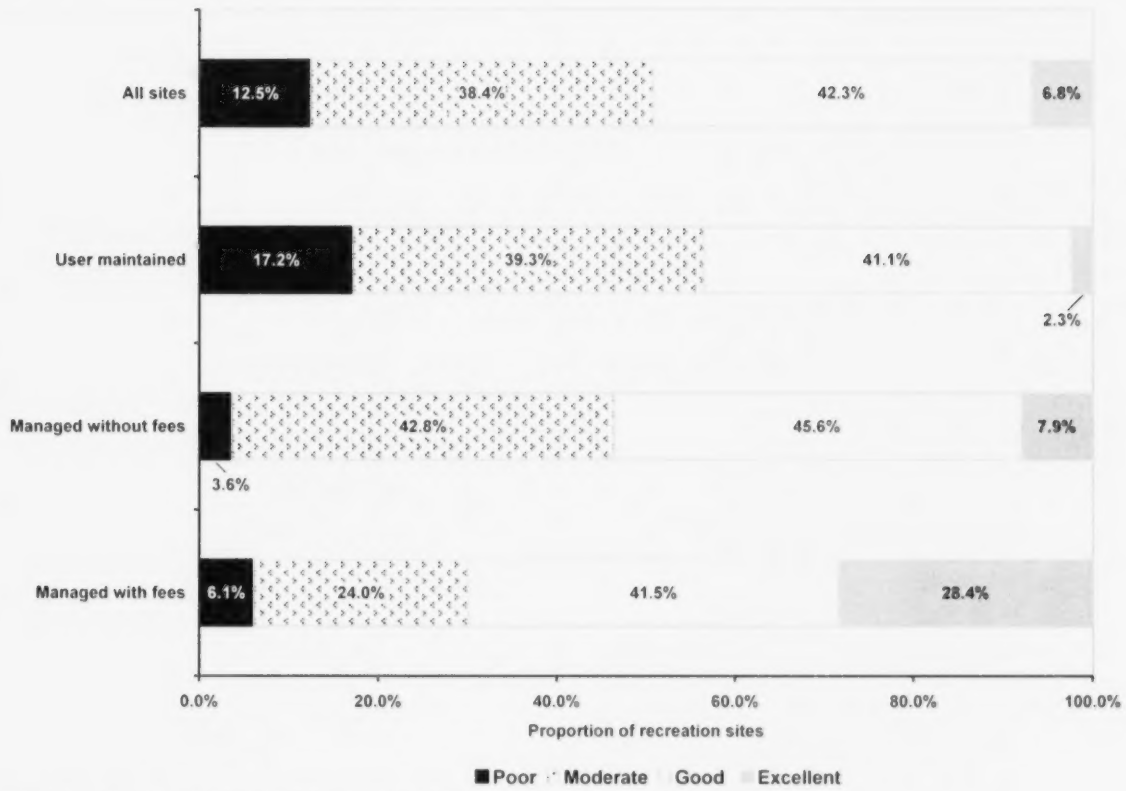



***Figure 14.*** *Quality of site design pooled by site type.*

***Table 11.*** *Estimated number of additional recreation facility units required, pooled by MoFR region.*

| | Additional number of units required (#) | | | |
|---|---|---|---|---|
| **Facility** | **CFR** | **NIR** | **SIR** | **All sites** |
| Entrance signs | 15 | 67 | 28 | 110 |
| 95 % CI (±) | 1 | 8 | 1 | 7 |
| Toilets | 81 | 0 | 80 | 161 |
| 95 % CI (±) | 23 | 0 | 4 | 11 |
| Kiosks | 24 | 7 | 234 | 266 |
| 95 % CI (±) | 2 | 0 | 23 | 31 |
| Directional signs | 97 | 32 | 475 | 604 |
| 95 % CI (±) | 29 | 3 | 96 | 144 |
| Tables | 258 | 49 | 833 | 1140 |
| 95 % CI (±) | 323 | 10 | 247 | 442 |
| Campsites | 385 | 45 | 763 | 1193 |
| 95 % CI (±) | 745 | 9 | 410 | 808 |
| Fire rings | 318 | 260 | 743 | 1321 |
| 95 % CI (±) | 411 | 101 | 277 | 639 |

### 3.6 *Overview of Results*

No clear trends emerged when comparing the condition of recreation sites between forest regions or between site types. Although no one region stood out as having a consistently poor performance, Table 12 summarizes the differences that did emerge between regions, and Table 13 compares results between site types.

The CFR appears to have the most safety-related issues, as well as the clearest evidence for poor visitor behaviour and misuse of recreation sites and site facilities. This is not a surprising result given that this region has the highest visitor pressure in the province. Recreation managers may want to consider launching visitor education campaigns in this region.

The SIR has some relatively serious issues related to site sanitation and erosion, and will require the largest investment for new facilities and road works.

It was very difficult to judge in absolute terms whether site management is affecting site condition based on the data presented in this report; however, the results suggest that site management is benefiting the condition of recreation sites, and that a lack thereof may be detracting from a positive visitor experience. UM sites performed the worst with respect to site sanitation (particularly the state of toilet facilities which are unlikely to be properly cared for by visitors), and had some clear safety issues as a result of hazard trees that need to be addressed. Furthermore, UM sites had the highest occurrence of invasive species, implying that a lack of site management may be beginning to affect forest health.

Notable differences between site types have been summarized in Table 13.

## 4.0 Recommendations

Overall, the study results were favourable, but there are clearly some areas of concern that need to be addressed by recreation managers. Although this pilot study resulted in the collection of some useful baseline information, it is not possible to answer the primary research question with any certainty in the absence of defined thresholds of acceptability and the subjective nature of some of the questions. The results certainly can, however, serve to refine and focus future studies in order to improve the objectivity and completeness of the data collected.

The following discussion outlines some major study design considerations that should be incorporated into future evaluation and monitoring of recreation sites. It also outlines some operational recommendations related to each focus area to provide guidance for immediate budget allocations.[14]

### 4.1 *Evaluation Program Design*

#### 4.1.1 Alternative Evaluation Strategies

This report provides useful baseline information and highlights priority areas for focusing immediate attention and resources. The information is limited to a snapshot in time, however, and a good portion of the information collected was based on subjective impressions of the condition of a particular facility or resource. Although this approach provides useful information for describing an overall picture for the province, increasing recreation use, public scrutiny, and participatory public land management have driven an increasing need for more objective information (Marion 1998).

In some cases, more objectivity could be achieved by providing more specific guidelines defining possible survey responses. The development of a field manual would be useful in this regard. More in-depth, detailed training may also be required to achieve more consistency among evaluators. For example, in question 5.1, evaluators were asked: "Are trees within the developed portion of the recreation site showing evidence of a significant forest pest infestation?" What is "significant" to one evaluator may not be significant to another, and it is impossible to quantify these inconsistencies.

14 The recommendations discussion has expanded on points outlined by Hull (2005).

*Table 12. Regional differences in the condition of recreation sites*

| Coast | Northern Interior | Southern Interior |
|---|---|---|
| • largest number of natural hazards present on-site<br>• most hazardous trees requiring full hazard tree evaluation<br>• largest number of unsafe toilets<br>• highest incidence of broken glass on-site and garbage on the shoreline<br>• highest incidence of human waste on-site<br>• highest level of trail erosion<br>• 100% of sites had signs of tree vandalism<br>• lowest levels of pest infestation, and no evidence of bark beetle<br>• highest proportion of user-made trails requiring remediation | • all natural hazards found on-site were not clearly identified<br>• most unsafe fire rings and tables<br>• highest incidence of unsightly garbage on-site<br>• lowest % of vandalised trees per site<br>• highest number of sites with signs of root damage<br>• notably few incidences of invasive species<br>• highest proportion of sites with bark beetle infection – over ½ of all sites across the province<br>• least road works required<br>• fewest user-made trails leading to the shoreline<br>• lowest levels of erosion on road system/parking area, trails and campsites | • greatest number of unsafe campsites and footbridges<br>• largest incidence of unsanitary garbage on-site<br>• largest proportion of sites with human/domestic animal waste outside of toilet facilities<br>• most sites with rutting, ponding or erosion on the road system/parking area and campsites<br>• highest incidence of all invasive species, excluding scotch broom<br>• fewest sites with root damage<br>• highest number of sites with trails leading to the shoreline<br>• the vast majority of road works are required here<br>• most additional facilities required |

*Table 13. Differences in the condition of recreation sites between site types*

| Managed with fees | Managed without fees | User maintained |
|---|---|---|
| • largest number of sites with natural hazards present on site<br>• with the exception of footbridges, has the safest site facilities<br>• highest incidence of broken glass and garbage on the shoreline<br>• highest proportion of sites with human waste outside of toilet facilities<br>• lowest proportion of sites with significant pest infestation<br>• lowest level of ponding, rutting and erosion on the road system/parking area, trails and campsites<br>• highest incidence of tree vandalism and root damage<br>• highest proportion of sites with trails leading to the shoreline<br>• best overall site design | • least amount of all types of garbage<br>• with the exception of footbridges, has the most unsafe facilities<br>• cleanest and best maintained toilets<br>• least tree vandalism and root damage<br>• highest levels of trail erosion<br>• highest proportion of user-made trails to the shoreline requiring remediation<br>• all docks, wharves and piers require remedial works | • all on-site hazards are poorly identified<br>• highest incidence of hazard trees requiring full evaluation, and incomplete hazard tree removal<br>• highest incidence of on-site unsightly and unsanitary garbage<br>• highest proportion of sites with human and/or animal waste outside of toilet facilities, and evidence of improper grey water disposal<br>• toilets in the worst condition in terms of cleanliness and odour<br>• highest levels of trail erosion on road system/parking area and campsites<br>• highest incidence of all invasive species studied<br>• greatest proportion of sites with poor site design and poorly defined campsites |

There is a growing body of literature in the field of "recreation ecology" (e.g., Buckley 2005, Liddle 1997, Na 2004), and many examples of formal visitor impact monitoring programs designed to provide an objective record of resource conditions (e.g., Campbell and MacKay 2004, Appendix 6).[15] The type, magnitude, and, in some instances, the causes of resource deterioration (i.e., use-related, environmental, managerial) can be detected and evaluated using management frameworks such as **Limits of Acceptable Change** (LAC) or **Visitor Impact Management** (VIM) systems (Marion 1998).

A key feature of these programs is the use of techniques, such as permanent monitoring plots and photo point monitoring, to gather repeated information on specific problem areas over time (Hull 2005). For example, permanent vegetation plots can be established to assess changes in vegetation composition and vigour over time (Campbell and MacKay 2004). Permanent plots could also be established to monitor the impact of bark beetle infestation, or the spread of invasive species on selected sites. Similarly, fixed measurements of root exposure or trail surface shape using trail profiling could be taken to assess erosion impacts. This approach will provide more concrete, quantifiable results that will help managers objectively assess the severity of these problems, and would be particularly useful for assessing recreation impacts on environmental quality.

Such an approach has been developed by BC Parks to assess the impacts of backcountry recreation activities – the BC Parks Backcountry Recreation Impact Monitoring Strategy (Appendix 6). Reviewing this program may provide some useful initial guidance, especially within the BC context. However, a detailed literature review and review of other existing visitor impact or recreation site monitoring programs should be completed by the Recreation Site Effectiveness Evaluation Working Group to assess the validity of this approach (see 7.2: Suggested Readings).

Regardless of what framework is adopted, it is clear that some threshold values need to be integrated into the evaluation program to meaningfully assess the effectiveness of recreation management practices.

15 See "Suggested Readings" in section 7.0.

### 4.1.2 Study Design

#### *Sample Size*

Similar future studies should definitely consider a larger sample size to increase confidence in study results, or combine new data with existing data to increase the total sample size. The minimum sample size recommended for a population size of 1200 with a 5% margin of error and 95% confidence level is approximately 295. The minimum recommended sample size at a 90% confidence level is 225 (Statistics Canada 2003).

#### *Study Strata*

No clear justification or description of the possible effects of the various stratification variables (i.e., forest region, site type and site size) was provided prior to their creation. It may be useful in the future to provide some discussion regarding what particular survey questions are expected to be affected by each stratum to facilitate discussion and future analysis.

#### *Site Selection*

Although a stratified simple random sampling design was used for this study, sites within each stratum were not in fact randomly selected. Rather, sites were selected in the field with no consideration of how many sites were being sampled in each stratum. As a result, some strata had only one site included in the sample, yielding unreliable (and difficult to determine) estimates of variance and decreasing confidence in the population estimates. In the future, sites should be pre-selected before field work is completed.

### 4.1.3 Field Data Form Design

A total of 167 questions were asked on the 17-page questionnaire (Appendix 1). Only a subset of questions was used to address the primary research question, while a large proportion of questions were obviously more useful for inventory or cost analysis purposes rather than directly relevant to the FREP program. The Recreation Site Effectiveness Evaluation Working Group may want to consider condensing the field form and tailoring it to the specific project objectives under the FREP mandate, or designing two different forms for each purpose for future studies.[16]

16 Hull (2005) provides some in-depth suggestions for improving each survey question that will not be reiterated here, but should be considered by recreation managers when designing future field surveys.

Dividing all questions up more clearly into subheadings or categories would be very useful from a data analysis perspective. The focus areas used in this report (i.e., site safety, site sanitation, environmental quality, facilities and maintenance, and site design) may be useful for future studies, although more detailed subdivision may also be beneficial. Questions on the field form could either be physically rearranged to reflect their inclusion in the different focus areas, or could be coded to indicate what focus area they are addressing.

In many cases, whether a question is a forced choice or a multiple choice should be clarified, and some double barrelled questions will need to be separated (e.g., questions 3.1 and 3.2) (Hull 2005). Some questions were far too vague, and the results could not be used to address the research goals. For example, question 5.12 reads: "Using the distribution code chart in Reference 5, record the distribution of vegetation (including trees) along the shoreline excluding sanctioned access points to the water body." The purpose of this question is unclear, and does not take into consideration the considerable natural variability in vegetation and forest cover between biogeoclimatic zones across BC. Question 7 in Appendix 2 asked evaluators to rate the odour of individual toilets from 1 to 5, with no specification of what the numbers other than 1 or 5 were indicating. These types of vague questions result in data that is difficult to interpret with any certainty.

Also, some questions asked for a percentage estimate, which is a very subjective approach that may not be appropriate in most cases. Categories should be established on the survey itself so that data can be more easily categorised and evaluated. For example, question 6.2 asks: "What percentage of trees in the developed portion of the site are vandalised?" Clearly, answers could vary considerably, and it may be useful to consider providing evaluators with a few distinct options (e.g., 0–5%, 5–25%, 25–50%, >50%).

Hull (2005) provides a detailed review of all survey questions that should be revisited when redesigning the field form for future evaluations.

### 4.1.4 Additional Information Required

In general, the survey questions were effective at providing broad information about some key indicators of the effectiveness of the recreation program; however, some consideration is needed regarding the completeness of the data collected, and the degree to which it achieves the research goals. For example, evidence of RV tank discharge or evidence of overflow or leaking from a toilet facility may indicate threats to water quality, but does not actually address the issue of whether water quality is being affected by that particular recreation site. Physically testing water quality at the shoreline in more heavily used areas adjacent to a site and comparing those data to water quality at up-stream sites would provide more useful information about visitor impacts. Even if this type of in-depth analysis was not performed on all sites at the resource stewardship monitoring level, it could be considered for intensive evaluations in the future.[17]

For many of the questions discussed in this report, having some idea of the specific visitor use levels across site types and for each forest region would have been helpful. Visitor use pressure on individual recreation sites is known to be highest in the Coast Forest Region, but incorporating actual visitor use numbers could potentially be useful for interpreting results from future studies, particularly when comparing trends between forest regions. For example, one would expect that where visitor use levels are highest, trail erosion rates would be higher than on more infrequently used sites.

It is clear that limited resources largely dictate the complexity of information that can be collected, so some of these suggestions may not be feasible at the provincial scale. If detailed information cannot be collected, however, it is important to ensure that the questions that are asked provide relevant and clear responses that can be quantitatively evaluated.

## 4.2 *Priority Action Areas*

One of the goals of this pilot project was to provide some useful information for directing new funding and personnel resources in the immediate future. Some clear priority areas have emerged for each of the five subsections, and are summarised below.

### 4.2.1 Site Safety

Although natural hazards were not widespread, a lack of hazard identification was a major concern across site types, particularly on user maintained sites. The associated risks depend largely on the frequency of visitor use, as well as the hazard in question, and efforts should focus on those sites with higher visitor use levels.

17 See FREP website for definitions of resource stewardship monitoring and intensive evaluations: http://www.for.gov.bc.ca/hfp/frep/index.html.

In addition, hazardous trees requiring a full hazard tree evaluation were present on 68.3% of sites across the province, and 53.2% of past hazard tree recommendations had not been carried out. With the considerable threat to tree health posed by the recent bark beetle epidemic, especially in the Northern Interior Region where infestation levels are highest, the number of hazard trees across the province has the potential to increase substantially. This issue deserves serious attention in order to deal with both the substantial number of existing hazard trees, as well as future risks related to declines in forest health.

Priority actions:

1. Post signs identifying natural hazards on sites with the highest visitor use levels.
2. Develop a provincial "Hazard Tree Action Plan," including a risk assessment of potential future bark beetle effects on tree death and recreation site safety.

### 4.2.2 Site Sanitation

Although limited in extent, the presence of unsightly and unsanitary garbage, including broken glass, was widespread across all sites (also includes the presence of garbage in toilets). The presence of domestic animal waste was also problematic. Although the problem could likely be dealt with through increased maintenance, building visitor awareness of the costs and health risks associated with on-site garbage, particularly unsanitary garbage, might serve to prevent or alleviate the problem altogether.

In the short term, volunteer garbage pickup days could be organized to deal with existing garbage on-site. These efforts could be initiated by partnership organizations where they exist, and district staff in other cases.

In the longer term, initiating a visitor awareness campaign, particularly on user maintained sites where problems with garbage appear to be most severe, is another option to explore. Recreation managers should review the effectiveness of other similar programs, and evaluate whether this approach would be appropriate for BC recreation sites. Given the high costs associated with garbage removal from toilet facilities, this could be the starting point for such a program.

Offensive odour was found in 12.1% of toilets. Although not a direct health risk, it can be very unpleasant and does deter visitors from using appropriate facilities. Recreation managers should consider composting toilets for all pit toilet replacements and new toilets (Steinfeld 1997).[18] Solar composting toilets can significantly reduce odour problems, and are designed to minimize risks to groundwater. They also do not require pumping, thereby reducing overall maintenance costs considerably (Steinfeld 1997).

Having appropriate toilet facilities will likely help reduce the problem of human waste found outside of toilet facilities. Although this wasn't a widespread problem, it is an important one, as any human waste can present considerable health risks.

Priority actions:

1. With cooperation from partnership agreement holders, review maintenance schedules, beginning with all sites where garbage was spread uniformly throughout the site.
2. Investigate the possible implementation of a visitor awareness campaign to inform recreation site users of the health risks and costs associated with on-site garbage disposal.

### 4.2.3 Environmental Quality

Although widespread, site erosion did not appear to be a severe problem, with most sites only having low erosion impacts. Erosion is a natural process, and while accelerated erosion due to human use can be problematic, it is somewhat inevitable and is usually contained to certain high-use areas. This is illustrated by the fact that although almost half of sites had evidence of root damage, this damage was restricted to a small proportion of the trees on any given site (Table 4). The problem then is likely localized and concentrated in high-use areas (i.e., trailheads, trails to toilet facilities, trails leading to water sources, etc.). A more effective approach to monitoring and targeting erosion control resources may be to establish permanent monitoring plots or photo-point monitoring stations to track changes over time, and then develop acceptable levels of change for these areas. Trail profiling has also been used effectively to monitor trail erosion rates (Marion 1998).

18 See http://www.solareco.com/articles/article.cfm/id/100 for a discussion on how composting toilet facilities work, as well as information on the leading suppliers in North America. Several Canadian national parks (e.g., Gwaii Haanas National Park, Pacific Rim National Park) have recently installed high-volume composting toilet facilities.

Tree vandalism is a major problem across site types with almost all sites showing some level of tree vandalism. There are a number of approaches that can be taken to address this issue. Some possibilities include:

- Provide opportunities for reporting vandalism.
- Start an education campaign to create awareness of the effects of tree vandalism including: a) increased risk of tree disease, b) costs of tree removal, c) increased hazard tree risk, etc.
- Conduct tours, discussing the costs of vandalism along with other major topics, or dedicate entire tours to viewing cases of vandalism.
- Produce regular reports on vandalism, including cumulative impacts and positive changes.
- Develop GIS maps of high-probability problem areas, likely related to visitor use statistics, then intensify patrols and posting in these areas.

Data collected on invasive species was limited, and the species list used in this study was far from complete – it focused mainly on species found in the BC Interior. Despite these shortcomings, those invasive species that were listed were found on approximately 1/5 of recreation sites across the province, reflecting the pervasiveness of the problem throughout BC (Klinkenburg 2006, Turner 2005). The spread of invasive species throughout the world has clearly been linked to patterns of human movement, particularly when people travel between developed urban/suburban/agricultural areas and wilderness environments. In higher-use areas, where native vegetation damage can be more severe and the risk of seed transfer via contaminated boots and other camping equipment is higher, there are considerably more opportunities for the establishment of more aggressive and adaptable invasive plants.

Although more targeted research is certainly needed to properly assess the severity of the invasive species risk on BC forest recreation sites, some measures can be taken in the short term to minimise risks until a more detailed analysis can be completed.

1. **Education:** educating staff and the public about the more commonly found invasive species and the associated risks to habitat loss and ecosystem health could be initiated by either partnership organisations or recreation staff. Invasive species workshops could be conducted by interested volunteers or local conservation groups to educate visitors on heavily used sites.
2. **Restoration:** organize volunteer invasive species removal activities, particularly in the summer months when visitor use is highest.

Priority actions:

1. Focus aspects of a visitor education campaign on risks to forest health, including the negative effects of tree vandalism and the spread of invasive species.
2. With cooperation from partnership agreement holders, initiate volunteer invasive species removal days.
3. Establish semi-permanent erosion monitoring plots in a select number of high traffic areas to pilot evaluation techniques for assessing rates of on-site erosion and vegetation damage.

### 4.2.4 Facilities and Maintenance

Clearly, the condition of toilet facilities, docks/piers, entrance signs and fire rings are particularly dire. Additionally, a significant increase in the number of on-site directional signs and kiosks is needed. Funding for infrastructure replacement ($355,041 in the 2005/2006 budget allocation (Hull 2005)) should be focused on these problem areas, particularly the improvements required for toilet facilities given their pivotal role in ensuring a healthy and enjoyable recreation experience for visitors.

Hull (2005) has projected infrastructure replacement costs at the provincial level, and it is clear that the current budget does not even approach what is needed (approximately $1M) to bring recreation sites up to ministry standards for only five types of facilities (tables, toilets, entrance signs, directional signs, kiosks). When the cost of adding needed additional facilities is considered, these numbers more than triple to close to $3.5M. Clearly either more funding is needed, sites will need to be prioritised, or sites that are considerably below ministry standards will need to be decommissioned.

Priority action:

Suggested facilities that should be prioritised for the allocation of infrastructure replacement funds include: toilet facilities, docks/wharves piers, fire rings, directional and entrance signs, and kiosks.

## 5.0 Lessons Learned

With respect to the design and implementation of this pilot study, there were several key lessons learned by the project team that could potentially inform and improve subsequent effectiveness evaluations for all resource values. These include:

1. **The more time spent up front planning, the fewer problems will be encountered during implementation.** Up-front planning must include: a) clear identification and buy-in of the project purpose, objectives and methodology, and b) clear definition and limitation of the project scope.
2. **Ensure that you know how each data element will be analyzed and used before you collect the data.**
   - Have baseline, acceptable levels and/or threshold data wherever possible for comparison.
   - Wherever possible, minimize subjective data collection.
   - If sub-sampling is planned at a site, make sure that a record is kept of the total number of secondary elements at the site.
3. **Train staff before they collect data and do quality assurance along the way.** This is especially important early on to detect errors/problems and correct them as soon as possible.
4. **Frequent communication between field staff and the Project Manager to ensure that implementation issues/problems are resolved as early as possible, and that solutions are communicated to all field staff.** Then:
   - Do frequent Question and Answer (Q&A) checks along the way.
   - Provide resources to field staff (e.g., Q&A support, data collection manuals) throughout the study.
5. **Do test analyses as early as possible to ensure that changes can be made if necessary.**
6. Start small. Begin with a pilot project, refine project design and management based on the results of the pilot, and then begin wider implementation.
7. **Set up a documentation system, including version control, early in the project to ensure all relevant documents (i.e., project plan, work plans, data, field cards and reports) are appropriately filed.**

## 6.0 Conclusions

This pilot study clearly yielded results that will be beneficial from several perspectives. First, these data provide valuable baseline information regarding the condition of recreation structures and facilities that is directly relevant to future infrastructure maintenance and replacement budget allocations. Next, it will assist the recreation program in determining some key threats to safety, sanitation, and environmental quality in the different MoFR regions, and has highlighted some particular areas of concern among different site types that may require additional resources in the future. Furthermore, it highlighted areas where methodological improvements can be made for future studies of this kind.

The current allocation of resources falls short of what is required to bring all recreation sites up to ministry standards, largely due to the very high infrastructure repair, replacement and additions costs indicated by these results. More resources are required to keep the current number of recreation sites across the province open, and functioning in a safe, sanitary and environmentally sound manner. Alternatively, amendments to ministry standards could be considered, or those sites that are in the worst condition may need to be shut down.

Given that resources remain limited at this point in time, the following priority actions have been identified in each research area in order to help direct efforts and funding in the short and medium term.

### *Site Safety*

- Post signs identifying natural hazards on sites with the highest visitor use levels.
- Develop a provincial "Hazard Tree Action Plan," including a risk assessment of potential future bark beetle effects on tree death and recreation site safety.

### *Sanitation*

- With cooperation from partnership agreement holders, review maintenance schedules, beginning with all sites where garbage was spread uniformly throughout the site.
- Investigate the possible implementation of a visitor awareness campaign to inform recreation site users of the health risks and costs associated with on-site garbage disposal.

***Environmental Quality***

- Focus aspects of a visitor education campaign on risks to forest health, including the negative effects of tree vandalism and the spread of invasive species.
- With cooperation from partnership agreement holders, initiate volunteer invasive species removal days.
- Establish semi-permanent erosion monitoring plots in a select number of high traffic areas to pilot evaluation techniques for assessing rates of on-site erosion and vegetation damage.

***Facilities and Maintenance***

- Suggested facilities that should be prioritised for the allocation of infrastructure replacement funds include: toilet facilities, docks/wharves piers, fire rings, directional and entrance signs, and kiosks.

As a pilot effectiveness evaluation under the auspices of the FREP program, this project has yielded some valuable lessons in terms of effective survey design and gaps in the type of information that was collected. Some consideration of new and more objective data collection methods is needed. Thresholds or acceptable limits need to be developed in order to quantify or calibrate survey results before any future studies are conducted. For example, what characteristics or indicators, when combined, make a site "unsafe?"

Finally, baseline maintenance standards did not exist for all facilities evaluated in this study, and before future evaluations are completed, these will have to be established.

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# APPENDIX 1. RECREATION SITE EVALUATION FIELD FORM

BRITISH COLUMBIA — FRPA Resource Evaluation Program

**Recreation Site Evaluation/ Field Form – Page 1**

**Site Information**

| | | | | | |
|---|---|---|---|---|---|
| Region: __ RSI __ RNI __ RCO | | | District: | | |
| Site Name: | | | Date of Evaluation: | | |
| Site Type: __ Managed with Fees __ Managed without Fees __ User Maintained | | | | | |
| Site Size: (Exhibit A) _____ Hectares | | | Vehicle Units: (from FTAS) | | |
| Evaluator Name: | | | Location: (Geographical) | | |
| UTM Zone | UTM Easting | UTM Northing | Elevation | Latitude | Longitude |
| | | | | | |

Road Access Status: __ FSR _____ km __ RP _____ km __ Public Road __ Non-Status _____ km (If multiple access roads to site, pick major route.) __ Other _____ — Project Number: (4 digit)

Agreement/Contractor Holder Name:

Agreement/Contractor Holder Type: __ Municipal Government __ First Nation __ Community Group __ Private Company __ Other __ Contract

Does agreement/contractor holder manage more than one recreation site? __ Y __ N

Has an Archaeological Impact Assessment been completed: __ Y __ N __ N/A __ Unknown

Maintenance Schedule: __ Weekly __ Daily __ Bi-weekly __ Monthly __ Other _____ — Last Maintainance Visit: _____ date __ N/A

Date of Last Hazard Tree Assessement: — C and E Patrol Schedule: __ Long Weekends __ As Required

**Part A – Initial Site Overview**

**Section 1 – In-site Roads**

1.1 How many metres of In-site Roads are in the recreation site? _____ m

1.2 How many metres of In-site Roads require remedial works? _____ m

1.3 Please identify any remedial works the In-site Roads require:

| | Length (m) |
|---|---|
| Grading | |
| Cleaning and grading ditches | |
| Brushing | |
| Subgrade repair | |
| Gravelling | |

1.4 For the In-site Roads that require remedial works, please choose one of the probable causes found in Reference 3. Code: ____

If you choose Other, please describe in the space below.

1.5 Is a stop sign required at entrance?

__ Y __ N

1.6 Identify any remedial works required at entrance: __ Grading __ Brushing __ Gravelling __ Cleaning/grading ditches __ Subgrade repair __ Culvert required

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Project No. _____ — **Recreation Site Evaluation/Field Form Page 2**

**Section 2 – Erosion**

2.1 What is the level of vehicle use off designated road systems within the recreation site? — N __ L __ M __ H __

*Evidence of vehicle use consists mainly of tracks through vegetation, resulting in damage to the vegetation (including trees), exposure of topsoil, damage to riparian areas, and the deepening and widening of puddles and wet areas off the road.*
*N = none, L = low, M = medium, H = high*
- *Check Low if <5% of the site shows evidence of off-road vehicle use.*
- *Check Medium if 5-20% of the site shows evidence of off-road vehicle use.*
- *Check High if >20% of the site shows evidence of off-road vehicle use.*

2.2 Are **all** ditches in the developed portion of the recreation site functional? If no, indicate length of repair: _____ m — Y __ N __ N/A __

*Visually inspect all ditches in the recreation site to ensure that they are not clogged with debris or vegetation.*

2.3 Number of culverts in the developed portion: _____

2.4 Are **all** culverts in the developed portion of the recreation site functional? If no, indicate number of non-functional culverts: _____

*Visually inspect all culverts in the recreation site to ensure that the culvert is the right size and that water is able to flow freely through the culvert.*

2.5 What is the level of rutting, ponding, and erosion on the road system and/or parking area within the developed portion of the recreation site? — N __ L __ M __ H __

- *Check Low if ruts are found on <10% of the road system.*
- *Check Medium if ruts are found on 10-30% of the road system.*
- *Check High if ruts are found on >30% of the road system.*

2.6 Is the site located in a flood plain? — Y __ N __

2.7 If archaeological sites exist on site, examine the site for any erosion around the archaeological sites or damage to archaeological features. — N __ L __ M __ H __ Unknown __

*None – No damage or erosion to or around any archaeological features or significant areas.*
*Low – Some damage or erosion that can be repaired in under one half-hour with minimal inputs of labour and materials (minor repair).*
*Medium – Significant damage or erosion that will take over one half-hour to repair and requires significant inputs of labour and material.*
*High – Major to irreparable damage or erosion requiring certain areas to be closed off to visitors or significant infrastructure built to prevent destruction of the archaeological site/feature.*

2.8 Recommended action for any erosion or damage to archaeological site?

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## Section 3 – Waste Management

*For the following questions, use the distribution codes from Reference 5 that best describe the amount and distribution of:*

### Sanitation

Code

3.1 Human and/or domestic animal waste outside of toilet facilities? ____

*Visually inspect the entire portion of the recreation site for any human and/or domestic animal waste.*

3.2 Indicate type of waste: __ human __ domestic animal __ geese __ wildlife

### Water Supply

3.3 RV holding tank discharge? ____

*Visually inspect the site for any evidence of RVs discharging holding tanks on site.*

3.4 Motor oil and other hazardous material? ____

*Search the site for evidence of motor oil, gasoline, paint, or any other hazardous material.*

3.5 Grey water disposal outside of designated disposal facilities? ____

### Garbage

3.6 Unsightly garbage in both the developed and undeveloped portions of the recreation site? ____

*Visually inspect the undeveloped portion of the recreation site to determine the amount of garbage (all kinds) in the recreation site.*

3.7 Unsanitary garbage in the developed and undeveloped portions of the recreation site? ____

*Visually inspect the entire recreation site for any unsanitary garbage, such as animal remains, diapers, used toilet paper, etc.*

3.8 Broken glass in both the developed and undeveloped portions of the recreation site? ____

*Visually inspect the developed portion of the recreation site to determine the amount of glass in the recreation site.*



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## Section 4 – Safety

### Natural Hazards

| | Y | N | None |
|---|---|---|---|
| 4.1 Are all significant natural hazards within the developed portion of the recreation site clearly identified? | __ | __ | __ |

*For example, look for natural hazards such as cliffs, waterfalls, rogue waves, unstable banks, and avalanche chutes. Natural hazards not included in this question are hazard trees, fires, earthquakes, lightning strikes, and dangerous animals. If natural hazards exist within the developed portion of the recreation site, check to see if signage exists that clearly identifies the hazard to visitors.*

| | Code | None |
|---|---|---|
| 4.2 If the recreation site is located on unstable ground or if there are steep and/or unstable slopes above or below the site, use the following codes to describe: | ____ | __ |

| Description | Code |
|---|---|
| *Landslides, slumps, rock falls, mudflows, or any type of mass wasting* | L |
| *Overhanging or steep banks with little or no vegetation* | O |
| *Road cuts on slopes near the recreation site with a gradient of over 10°* | RC |
| *Soil creep ("pistol butt" trees)* | SC |
| *Oversteepened slopes* | OS |
| *Undercut and/or receding stream banks* | UC |
| *Avalanche chutes* | AC |

### Hazard trees

| | Y | N | None |
|---|---|---|---|
| 4.3 Does it appear that recommendations from the last Wildlife Danger Tree Hazard Assessment have been carried out? | __ | __ | __ |
| 4.4 Is there evidence of hazardous trees on the site that would require a full hazard tree evaluation? | __ | __ | __ |

*Use the information gathered in the Tree Damage section to determine the risk posed to visitors in the campsite by hazard trees.*

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## Section 5 - Environmental Quality

### Forest Health

5.1 Are trees within the developed portion of the recreation site showing evidence of a significant forest pest infestation? Y N
If so, indicate the percentage of trees showing signs of forest pest infestation. *(If none, enter 0)* _____ %

*Visually inspect all of the trees within the developed portion of the recreation site for signs of forest pests, such as: tree mortality, bore holes in bark, pitch tubes, and sawdust at the base of the tree.*

5.2 Indicate the type of pest infestation
__ Bark Beetle
__ Root Disease
__ Other (describe) _____

5.3 Are trees within the developed portion of the recreation site showing evidence of root and/or heart rot? Y N
What percentage of trees show rot? *(If none, enter 0)* _____ %

*Visually inspect all of the trees within the developed portion of the recreation site for signs of heart and root rot. Look for fruiting bodies of fungi to indicate heart rot and resin and/or mushrooms at the base of the tree. See the attached examples.*

5.4 Are trees within the undeveloped portion of the recreation site showing evidence of root and/or heart rot? Y N
What percentage of trees show rot? *(If none, enter 0)* _____ %

5.5 Using distribution codes from Reference 5, describe the amount and distribution of understorey vegetation in the developed portion of the recreation site. Code

*Understorey vegetation includes grasses, shrubs, and any trees that are below the canopy layer.*

### Invasive Plants

5.6 If there are invasive plants in the recreation site, record the species and distribution code below. *(See References 4 and 5 for invasive plant and distribution codes.)*

| Species Code | Distribution Code |
|---|---|
| | |
| | |
| | |
| | |
| | |

*Visually identify and record the noxious weeds found in the recreation site. The risk posed to the natural environment from noxious weeds will be determined during the analysis of collected data.*

### Part A Overview Comments

____ Unknown

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## Part B – Trails, Shoreline, Facilities/Structures, and Site Design

### Trails within Recreation Site

No trails __

5.7 What is the level of visible erosion on the trail system within the recreation site? N L M H

*Includes trails to facilities but not hiking trails.*
*N = none, L = low, M = medium, H = high*
- *Check Low if the trail is in good shape with minor evidence of erosion.*
- *Check Medium if the trail is in fair shape, with small washouts, significant evidence of water flow in the trail, and/or evidence that the trail is widening due to trampling of vegetation.*
- *Check High if the trail is in poor shape with evidence of water flow in the trail, multiple washouts, and widespread trampling outside of the original trail boundaries.*

### Shoreline Area

No shoreline __

5.8 Estimate the length in metres of the shoreline in the developed portion of the recreation site.

5.9 How many developed water access points (e.g. boat launches, paths, beaches) are in the developed portion of the recreation site?

5.10 How many user-made trails leading to a waterbody are in the developed portion of the recreation site?

5.11 Is remedial action required? Y N
If yes, describe.

5.12 Using the distribution code chart in Reference 5, record the distribution of vegetation (including trees) along the shoreline excluding sanctioned access points to the waterbody (e.g. boat launches, paths, beaches, etc.) Code

5.13 Using the distribution code chart in Reference 5, inspect the shoreline area within the developed portion of the recreation site for garbage, broken glass, and hazardous waste.

5.14 Using the distribution code chart in Reference 5, record distribution of driftwood debris on the shoreline.

5.15 Is the distribution of driftwood significantly affecting public use and access of shoreline? Y N

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## Section 6 – Facilities/Structures

6.1 *Go to Appendices 1, 2 and 3 to complete facilities/structure assessment before completing Tree Damage section.*

### Tree Damage

*If the site has no trees, please check the adjacent box. Complete this section after campsite assessment.* No trees ___

6.2 What percentage of trees in the developed portion of the recreation site are vandalized?

*(If none, enter 0)* _____ %

*Look for signs of vandalism such as axe marks, tree girdling, carvings, stumps from trees that have been cut illegally, etc.*

6.3 What percentage of trees in the undeveloped portion of the recreation site are vandalized?

*(If none, enter 0)* _____ %

*Look for signs of vandalism such as axe marks, tree girdling, carvings, stumps from trees that have been cut illegally, etc.*

6.4 What percentage of trees have damaged roots? *(If none, enter 0)* _____ %

*Visually inspect the developed portion of the recreation site to determine the amount of trees with root exposure.*

### 6.5 Boat Launches

6.5.1 How many boat launches in total are in the recreation site? _____

**Individual boat launches**

*Evaluate all of the boat launches individually using the following indicators.*

6.5.2 What type of boat launch?
___ cartop ___ boat trailer ___ undeveloped

6.5.3 Is the boat launch functional? Y ___ N ___

6.5.4 What is the boat launch material? ___ gravel ___ cement

6.5.5 Please record any remedial works the boat launch requires. *(Reference 1 defines these terms)*

Min. Repairs ___ Maj. Repairs ___ Replace ___ Remove ___ Relocate ___

6.5.6 If the boat launch requires remedial works, please choose one of the probable causes found in Reference 3. If you choose Other, please describe in the adjacent space. Code ___

_____

_____

_____



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### 6.6 Docks/wharves/piers

6.6.1 Total number of docks/wharves/piers in the recreation site? *(If none, enter 0)* _____

*For each dock, wharf or pier, enter the response to the following questions in the table below.*

6.6.2 Indicate type of structure: W = wharf, D = dock (floating), P = Pier. Code

6.6.3 Is the dock/wharf/pier functional? Y or N

6.6.4 Record any remedial works the dock/wharf/pier requires. *(See Reference 1 for remedial repair codes.)* Code

6.6.5 If dock/wharf/pier requires remedial works, please choose probable causes. *(See Reference 3 for probable cause codes.)* If you choose Other, describe below. Code

_____

_____

6.6.6 Number of additional docks/wharves/piers required: *(if none, enter 0)* _____

Questions

| Structure No. | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |

### 6.7 Other Structures (corrals, sheds, shelters, cattleguards)

6.7.1 Total number of corrals/sheds/shelters/cattleguards in recreation site? _____

*For each structure, enter the response to the following questions in the table below.*

6.7.2 Indicate type of structure: Code
C = corral, S = shed, D = day shelter, C = cabin, G = cattleguard

6.7.3 Is the structure functional? Y or N

6.7.4 Record any remedial works the structure requires. *(See Reference 1 for remedial repair codes.)* Code

6.7.5 If the structure requires remedial works, please choose probable causes. *(See Reference 3 for probable cause codes.)* If you choose Other, describe below. Code

_____

_____

6.7.6 Number of additional structures required: _____ corral _____ shed _____ day shelter _____ cabin _____ cattleguard Total number _____

Questions

| Structure No. | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |

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**6.8 Fencing**

6.8.1 How many metres of fencing are in the recreation site? _____
*(If none, enter 0)*

6.8.2 How many metres of fencing are at, above, or below the MoF standard?
__ At _____
__ Above _____
__ Below _____

6.8.3 What type of fencing is it? __ Wood __ Chainlink

6.8.4 Please record the amount (in metres) of fencing requiring remedial works. _____ m
*(Reference 1 defines these terms)*

__ Min. Repairs __ Maj. Repairs __ Paint __ Replace __ Remove __ Relocate

6.8.5 How many additional metres of fencing is required? _____ m

6.8.6 For the fencing that requires remedial works, please choose one of the probable causes found in the Probable Cause appendix. If you choose Other, please describe in the adjacent space. Code ____

_____

_____

**6.9 Foot Bridges**

6.9.1 Total number of foot bridges in the recreation site? _____

*For each structure, enter the response to the following questions in the table below.*

6.9.2 Indicate type of foot bridge: Code
**F** = standard foot bridge, **S** = suspension, **V** = previous vehicle crossing

6.9.3 Is the foot bridge safe to use? Y or N

6.9.4 Span of foot bridge (metres) Number

6.9.5 Record any remedial works the structure requires. Code
*(See Reference 1 for remedial repair codes.)*

6.9.6 If the structure requires remedial works, please choose probable causes. *(See Reference 3 for probable cause codes.)* Code
If you choose Other, describe below.

_____

_____

6.9.7 Does the foot bridge require regular inspection? Y or N

6.9.8 Number of additional foot bridges required: _____ standard foot bridge _____ suspension _____ previous vehicle crossing Total number _____

Questions

| Structure No. | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| 1 | | | | | | |
| 2 | | | | | | |
| 3 | | | | | | |

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**6.10 Parking Areas**

6.10.1 Approximate number of vehicle spaces in parking area: _____ or None __

6.10.2 Is parking area functional? __ Yes __ No

6.10.3 How many additional parking spaces are required? _____

6.10.4 Approximate number of vehicle spaces requiring remedial works. _____
*(Reference 1 defines these terms)*

__ Min. Repairs __ Maj. Repairs __ Deactivate __ Relocate

6.10.5 For the parking areas that require remedial works, please choose one of the probable causes found in the Probable Cause appendix. If you choose Other, please describe in the adjacent space. Code ____

_____

_____

**6.11 Traffic Barriers**

6.11.1 Total number of traffic barriers in the recreation site. _____

*For each structure, enter the response to the following questions in the table below.*

6.11.2 Indicate type of traffic barrier: Code
**L** = logs, **P** = post, **R** = rock, **MG** = metal gate, **NP** = no post, **LB** = lock block

6.11.3 Length of barrier (metres) Number

6.11.4 Record any remedial works the barrier requires. Code
*(See Reference 1 for remedial repair codes.)*

6.11.5 If the barrier requires remedial works, please choose probable causes. *(See Reference 3 for probable cause codes.)* Code
If you choose Other, describe below.

_____

_____

6.11.6 Number of additional barriers required: ____ logs ____ post ____ rock ____ metal gate ____ no post ____ lock block Total number _____

Questions

| Structure No. | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |

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## Section 7 – Recreation Site Design (Spirit of Place)

7.1 Is the site meeting its objectives? Unknown Y N

7.2 If not, please explain why.

7.3 Rate the design or layout of the recreation site for consistency of design principles and the aesthetic quality of the recreation site, given site-specific user needs and the natural environment of the recreation site. E G M P

*E = excellent, G = good, M = moderate, P = poor*

*Check Excellent if:*

- *the on site road is laid out in a loop fashion or adequate turning area (excluding spurs)*
- *90% of campsites are well-defined (see Reference 2 for criteria)*
- *90% of campsites have a flat level space large enough for a tent or medium-sized trailer (see Reference 2 for criteria)*
- *90% of campsites are placed in a location that provides a sense of privacy for visitors and blends in with the natural environment*
- *facilities/structures such as toilets and directional signs are located in places that blend in with the natural environment while remaining easily accessible (toilets) or visible (signs) to visitors*
- *the recreation site is well screened from vehicle noise on adjacent roads*
- *there is adequate access to the main recreation feature for all visitors to the recreation site*

*Check Good if:*

- *the recreation site does not meet at most two of the requirements for the design of the recreation site to be considered Excellent (above)*

*Check Moderate if:*

- *the recreation site does not meet three of the requirements for the design of the recreation site to be considered Excellent (above)*

*Check Poor if:*

- *the recreation site does not meet four or more of the requirements for the design of the recreation site to be considered Excellent (above)*

Site Design Comments:

Other Comments or Recommendations:



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## Appendix 1 – Individual Toilet Assessment

1. Total number of toilets in the recreation site: _____
2. Total number of additional toilets required (minimum 1 per 6 campsites): _____

*For each toilet, enter the response to the following questions in the table below.*

3. Is the toilet at, above, or below MoF standard? 1 to 3
   1. At 2. Above 3. Below
4. If the toilet is below standard, please enter remedial repair code from remedial repair criteria in Reference 1. Code
5. If the toilet is below standard, please choose one of probable cause codes in Reference 3. Code
6. Is the toilet safe to use? Y or N
7. Rate the odour of the toilet. 1 to 5
   1 = no odour, 5 = cannot be used
8. If toilet odour is rated 4 or 5, enter code for probable cause *(see Reference 3)* Code
9. Is the toilet a sealed tank? Y or N
10. Is the toilet located at least 30 metres from riparian area? Y or N
11. Is there evidence of the toilet overflowing or leaking? Y or N
12. Is it a handicap toilet? Y or N
13. If the toilet is handicap, is it accessible? Y or N
14. Is the distance between the toilet seat and human waste at least 1.5 metres? Y or N
15. Is the surface of the toilet free of human waste? (includes walls, floor, roof, etc.) Y or N
16. Is there evidence of garbage in the toilet? Y or N
17. Type of toilet: **M** = metal, **C** = cement, **OW** = other wood Code

| Toilet No. | Question No. | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| 1 | | | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | |

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## Appendix 2 – Recreation Site Sign Assessment

### Entrance Signs

1. __ At __ Above __ Below MoF standard
2. Remedial Works required: Code

| | |
|---|---|
| Brushing | BR |
| Minor Repairs | MI |
| Clean | CL |
| Major Repairs | MA |
| Paint | PA |
| Remove | RE |
| Relocate/Rehab | RR |
| Replace | RP |
| None | NO |

3. Number of additional signs required: _____

| Sign No. | Question No. 2 |
|---|---|
| 1 | |
| 2 | |

### Kiosks

1. __ At __ Above __ Below MoF standard
2. Total number of kiosks: _____
3. Number of additional kiosks required: _____
4. Remedial Works required: Code
5. Does it contain a map of the campsite? Y or N
6. Does it contain a list of rules? Y or N
7. Does it contain fee information? Y or N

| Kiosk No. | Question No. 4 | 5 | 6 | 7 |
|---|---|---|---|---|
| 1 | | | | |
| 2 | | | | |

### Directional Signs (internal information signs)

| | Y | N |
|---|---|---|
| 1. Does the recreation site have functional highway signage? | __ | __ |
| 2. How many additional directional signs leading to the site are required? | _____ | |
| 3. How many directional posts or signs are in the recreation site? | _____ | |
| 4. How many additional directional posts or signs are required in the recreation site? | _____ | |
| 5. Is the sign at (1), above (2), or below (3) MoF standard? | 1 to 3 | |
| 6. Remedial Works required. Refer to above Remedial Works codes | Code | |
| 7. Type of sign: **F** = facility (toilet, trail, etc.); **D** = directional (directions to recreation site) | Code | |

| Sign No. | Question No. 5 | 6 | 7 | Sign No. | Question No. 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| 1 | | | | 7 | | | |
| 2 | | | | 8 | | | |
| 3 | | | | 9 | | | |
| 4 | | | | 10 | | | |
| 5 | | | | 11 | | | |
| 6 | | | | 12 | | | |

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## Appendix 3 – Individual Campsite Assessment (including walk-in sites)

*To determine the number of campsites to sample, refer to Reference 6.*
*Provide separate responses for each campsite (this page) and for its table and list (next page).*

### Individual Campsite

| | | Y | N |
|---|---|---|---|
| 1. | Total number of campsites: | _____ | |
| 2. | Total number of well-defined campsites: *(Campsites must have excellent or good conditions to be considered well-defined. See Reference 2 for criteria.)* | _____ | |
| 3. | Is an overflow area required for peak use? *(i.e. additional parking or toilet required, but no tables, fire rings)* | | |
| 4. | If an overflow area is required, indicate number of camping parties | _____ | |
| 5. | Total number of additional campsites required to meet average use consistent with public expectations for an enjoyable camping experience | _____ | |
| 6. | Is the campsite safe to use? | Y or N | |
| 7. | How defined is the site? *(see Reference 2 for criteria)* | Code | |
| 8. | Is there a flat area large enough for tent and vehicle? | Y or N | |
| 9. | Are there visible signs of erosion or poor drainage? | Y or N | |
| 10. | Is there a site marker at the entrance to the campsite? | Y or N | |
| 11. | Remedial work required? *(see Reference 7)* | Code | |
| 12. | Probable cause of remedial work? *(see Reference 7)* | Code | |

| Campsite No. | Campsite questions 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|
| 1 | | | | | | | |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | | | |
| 6 | | | | | | | |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 10 | | | | | | | |
| 11 | | | | | | | |
| 12 | | | | | | | |
| 13 | | | | | | | |
| 14 | | | | | | | |
| 15 | | | | | | | |

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## Appendix 3 – Individual Campsite Assessment (continued)

### Tables and Fire Rings

1. Total number of existing tables/rings (at or below standard): _____ _____
2. Total number of tables/rings to replace: _____ _____
3. Total number of new tables/rings required (from question 4): _____ _____
4. Is the table/ring **1** = at, **2** = above, or **3** = below MoF standard? 1 to 3
5. Is a new table/ring required? (no table/ring on site or day use) Y or N
6. Is structure safe to use? Y or N
7. Remedial work required? (*see Reference 1*) Code
8. Probable cause of remedial work? (*see Reference 3*) Code
9. Type of table/ring Code
   Tables: C – concrete, W – wood, P – plastic.
   Rings: M – standard metal, OM – other metal, R – rock
10. Is table/ring anchored? Y or N

| Campsite No. | Table questions | | | | | | |
|---|---|---|---|---|---|---|---|
| | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 1 | | | | | | | |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | | | |
| 6 | | | | | | | |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 10 | | | | | | | |
| 11 | | | | | | | |
| 12 | | | | | | | |
| 13 | | | | | | | |
| 14 | | | | | | | |
| 15 | | | | | | | |

| Campsite No. | Fire ring questions | | | | | | |
|---|---|---|---|---|---|---|---|
| | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 1 | | | | | | | |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | | | |
| 6 | | | | | | | |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 10 | | | | | | | |
| 11 | | | | | | | |
| 12 | | | | | | | |
| 13 | | | | | | | |
| 14 | | | | | | | |
| 15 | | | | | | | |

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### Reference 1 – Remedial Repairs Criteria Codes

| | | |
|---|---|---|
| MI | Minor Repairs | Repairs that generally take one half-hour to complete and involve minimal inputs of labour and materials. |
| MA | Major Repairs | Repairs that generally take longer than one half-hour to complete and involve significant inputs of time and labour. |
| PA | Paint | |
| RE | Remove | Either the site has too many of the facilities/structures based on the perceived use, or the facility/structure is damaged beyond repair and needs to be removed. |
| RP | Replace | |
| RR | Relocate-Rehab | Is not located in the most effective place and could be relocated without compromising environmental or aesthetic qualities. |
| CL | Clean | Needs to be cleaned in order to bring it up to standard. Power washing required. |
| NO | None | |
| BR | Brushing | Remove brush/vegetation adjacent to facility/structure. |

### Reference 2 – Defined Campsite Criteria

| | | |
|---|---|---|
| E | Excellent | • The campsite is design to standard which takes into account the terrain and vegetation of the area and blends in with the natural environment.<br>• Ideally, the centre of the campsite should be 30 m from the centre of the adjacent campsite if terrain, vegetation and size of recreation site permit it.<br>• The campsite has an 8 m diameter and is designed to provide sufficient space to park a vehicle and either set up a tent or park a medium-sized trailer. Campsite is level and flat. |
| G | Good | • One of the conditions mentioned above is not met. |
| M | Moderate | • Two of the conditions above are not met. |
| P | Poor | • None of the conditions above are met. |

### Reference 3 – Probable Cause Codes

| | | | |
|---|---|---|---|
| Vandalism | V | Snow | Sn |
| Inadequate maintenance | M | Poor location | L |
| Inadequate supervision | S | Inadequate facilities | F |
| Infrequent patrols | P | Inadequate information | I |
| Normal wear and tear | T | Wildlife | W |
| Wind | B | Overuse | O |
| Flooding | F | Not designed to standard | D |
| Fire | Fi | Landslide | Ls |
| Erosion | E | | |

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Reference 4 – Species Code Chart

| Species Name | Species Code |
|---|---|
| Annual Sowthistle | AS |
| Canada Thistle | CT |
| Crupina | C |
| Dalmatian Toadflax | DT |
| Diffuse Knapweed | DK |
| Dodder | D |
| Gorse | G |
| Hound's Tongue | HT |
| Jointed Goatgrass | JG |
| Leafy Spurge | LS |
| Perennial Sowthistle | PS |
| Purple Nutsedge | PN |
| Rush Skeletonweed | RS |
| Scentless Chamomile | SC |
| Spotted Knapweed | SK |
| Tansy Ragwort | TR |
| Velvetleaf | VL |
| Wild Oats | WO |
| Yellow Nutsedge | YN |
| Yellow Starthistle | YS |
| Yellow Toadflax | YT |

Reference 5 – Distribution Code Chart

| Code | Description |
|---|---|
| 0 | no occurrence |
| 1 | rare or single occurrence |
| 2 | a few spread sporadically throughout |
| 3 | clustered in a single spot |
| 4 | several spread sporadically throughout |
| 5 | clustered in a few spots |
| 6 | clustered in several spots |
| 7 | spread uniformly throughout |
| 8 | spread throughout the site with some gaps in distribution |
| 9 | spread densely throughout |

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## APPENDIX 2: ESTIMATING TOTALS AND PROPORTIONS UNDER STRATIFIED SIMPLE RANDOM SAMPLING[20]

The population has been pre-stratified into $H$ strata and a simple random sample has been taken within each stratum. We are interested in estimating both the total (length of trail, number of toilets, etc.) and the proportion (of sites, units, etc.) having a particular primary characteristic in (a) certain domains of interest (i.e., groups of strata) and (b) the total population (i.e., all strata combined). The material below can be found in Cochran (1977).

**Notation**

$n_h$ – number of sites sampled in $h^{th}$ stratum, $h = 1,2,\ldots,H$

$N_h$ – total number of sites in $h^{th}$ stratum

$f_h$ – finite population correction (fpc) factor for the $h^{th}$ stratum $= \dfrac{n_h}{N_h} = \dfrac{1}{w_h}$, where $w_h$ is the sampling weight

$N$ – total number of sites in population $= \sum_{h=1}^{H} N_h$

$N_{D}$ – total number of sites in domain of interest $= \sum_{h \in D} N_h$ (i.e., summing over those strata within the domain of interest). Note that this sum would include all strata if the domain of interest is the entire population.

$y_{hi}$ – indicator (e.g., 1 or 0), count or measurement of a primary characteristic for $i^{th}$ site in $h^{th}$ stratum, $i = 1,2,\ldots,n_h$ (e.g., number *unsafe* fire rings)

$x_{hi}$ – indicator, count or measurement of a secondary characteristic of $i^{th}$ site in $h^{th}$ stratum (e.g., number of fire rings)

$y_h$ – sample total of primary characteristic in $h^{th}$ stratum $= \sum_{i=1}^{n_h} y_{hi}$

$x_h$ –sample total of secondary characteristic in $h^{th}$ stratum $= \sum_{i=1}^{n_h} x_{hi}$

$\hat{Y}_h$ – estimated population total of primary characteristic in $h^{th}$ stratum $= N_h \cdot \dfrac{y_h}{n_h} = w_h \cdot y_h$

$\hat{X}_h$ – estimated population total of secondary characteristic in $h^{th}$ stratum $= N_h \cdot \dfrac{x_h}{n_h} = w_h \cdot x_h$

$\hat{Y}_D$ – estimated population total of primary characteristic in domain of interest $= \sum_{h \in D} \hat{Y}_h$

$\hat{X}_D$ – estimated population total of secondary characteristic in domain of interest $= \sum_{h \in D} \hat{X}_h$

$\hat{P}_D$ – estimated proportion having primary characteristic in domain of interest

20 Prepared by Peter Ott (2006).

**Estimators**

The true population total (e.g., length of trail, number of toilets, etc.) in a domain is: $Y_{[D]} = \sum_{h \in [D]} Y_h = \sum_{h \in [D]} \sum_{j=1}^{N_h} y_{hj}$

The estimated total for a domain is: $\hat{Y}_{[D]} = \sum_{h \in [D]} \hat{Y}_h = \sum_{h \in [D]} \frac{N_h}{n_h} \sum_{j=1}^{n_h} y_{hj}$ ,

with estimated variance: $v\left(\hat{Y}_{[D]}\right) = \sum_{h \in [D]} N_h^2 (1 - f_h) \frac{s_h^2}{n_h}$ , where $s_h^2 = \frac{1}{n_h - 1} \sum_{j=1}^{n_h} \left(y_{hj} - \bar{y}_h\right)^2$

For proportions, two different sets of estimators are shown below:

1. Both primary characteristic $y_{hj}$ and secondary characteristic $v_{hj}$ are indicators, and it is known beforehand that all $N_h$ sites have the secondary characteristic (e.g., all sites are on the ground, but only some on unstable ground).

   The true proportion is the ratio of population totals: $P_{[D]} = \frac{\sum_{h \in [D]} Y_h}{\sum_{h \in [D]} N_h}$

   The estimated proportion is: $\hat{P}_{[D]} = \frac{\sum_{h \in [D]} \hat{Y}_h}{\sum_{h \in [D]} N_h} = \frac{\hat{Y}_{[D]}}{N_{[D]}}$

   Let $\hat{p}_h = \frac{v_h}{n_h}$ , so $\hat{Y}_h = N_h \hat{p}_h$ with estimated variance $v\left(\hat{Y}_h\right) = \frac{N_h^2 (1 - f_h)}{n_h - 1} \hat{p}_h (1 - \hat{p}_h)$ .

   Therefore, $v\left(\hat{P}_{[D]}\right) = \frac{1}{\left(\sum_{h \in [D]} N_h\right)^2} \sum_{h \in [D]} v\left(\hat{Y}_h\right)$

2. Both primary and secondary characteristic are present in only some of the sites (e.g., only some sites have fire rings, and only some of these have unsafe ones).

   For this situation, the true proportion is the ratio of population totals: $P_{[D]} = \frac{\sum_{h \in [D]} Y_h}{\sum_{h \in [D]} X_h}$

   Note that both totals in this ratio must be estimated, causing the estimated proportion to be a combined ratio estimator: $\hat{P}_{[D]} = \frac{\hat{Y}_{[D]}}{\hat{X}_{[D]}}$

   To get its variance, first calculate: $e_{hj} = y_{hj} - \hat{P}_{[D]} x_{hj}$ , and then $\bar{e}_h = \frac{1}{n_h} \sum_{j=1}^{n_h} e_{hj}$

   Next, calculate the sample variance for each stratum $s_h^2 = \frac{1}{n_h - 1} \sum_{j=1}^{n_h} \left(e_{hj} - \bar{e}_h\right)^2$

The estimated variance is then: $v\left(\hat{P}_{ij}\right) = \frac{1}{\hat{X}_{ij}^2} \sum_{h \in U} \frac{N_h^2 (1 - f_h)}{n_h} s_{ih}^2$

**Confidence Intervals**

An approximate $100 \cdot (1 - \alpha)\%$ confidence interval for $P_{ij}$ can be constructed using $\hat{P}_{ij} \pm z_{\alpha/2} \cdot \sqrt{v\left(\hat{P}_{ij}\right)}$ where $z$ is a standard normal critical value and $\alpha$ is the pre-specified level of significance (e.g., $z_{0.025} = 1.96$)

## APPENDIX 3. REALLOCATION OF MISCLASSIFIED RECREATION SITES[21]

### *Coastal Region Recreation Sites*[21]

| Managed with fees | | Managed without fees | | User maintained | |
|---|---|---|---|---|---|
| 20 or more vehicle units | Less than 20 vehicle units | 20 or more vehicle units | Less than 20 vehicle units | 20 or more vehicle units | Less than 20 vehicle units |
| Chehalis Lake (North) | Fry Gravel Pit | **Muchalat Lake** | Spetch Creek | | Cone Head |
| Cal-Cheak | Gosling Lake | **Gray Bay** | Scout Beach | | **Riverside** |
| Upper Lillooet River | Log Creek | | Arden Creek | | **Hideaway** |
| Lizard Lake | Sloquet Hotsprings | | **Stella Bay** | | **Georgie Lake** |
| Skwellepil Creek | Merrill Lake | | **McCreight Lake** | | **Blackwater Lake** |
| Maple Grove | Mohun Lake | | **Pye Beach** | | |
| Toquart Bay | Dinner Rock | | **Dodd Lake** | | |
| | **Brewster Camp** | | **Long Point** | | |
| 7 | 8 | 2 | 8 | 0 | 5 |

### *Northern Interior Region Recreation Sites*[22]

| Managed with fees | | Managed without fees | | User maintained | |
|---|---|---|---|---|---|
| 20 or more vehicle units | Less than 20 vehicle units | 20 or more vehicle units | Less than 20 vehicle units | 20 or more vehicle units | Less than 20 vehicle units |
| Petersons Beach | Moose Lake | Norallee West | Chist Creek | Red Sands Lake | Amanita Lake |
| | | Noralee East | Knapp Lake | Whitefish Bay | Naver Creek |
| | | **Bear Island** | Pinkut Lake | Summit Lake | Stuart Lake – Battleship |
| | | | Augier Lake | **Crystal Lake** | Blackwater Crossing |
| | | | Richmond Lake | | Burner Bay |
| | | | **Morice Lake** | | Foot Lake |
| | | | **Manson Lake** | | Borel Lake |
| | | | | | Gething Creek |
| | | | | | Laurie Lake |
| | | | | | Cleswuncut Lake |
| | | | | | Cutoff Creek |
| | | | | | Jigsaw Lake |
| | | | | | **Meuoon Lake** |
| | | | | | **Fisher Lake** |
| 1 | 1 | 3 | 7 | 4 | 14 |

21 Source: Hull (2005).
22 Bolded entries signify site category changed.

## *Southern Interior Region Recreation Sites*[22]

| Managed with fees | | Managed without fees | | User maintained | |
|---|---|---|---|---|---|
| 20 or more vehicle units | Less than 20 vehicle units | 20 or more vehicle units | Less than 20 vehicle units | 20 or more vehicle units | Less than 20 vehicle units |
| Noisy Creek – DOS | Harmon Lake West – DCS | Coldscaur Lake North – DHW | Granite Creek – DCS | Dugan Lake – DCC | Horsefly River – DCC |
| Kwotlenemo Lk S. – DCS | Shea Lake – DCS | Tranquille River – DKA | Bonaparte Lake – DKA | Doreen Lake – DOS | Kootenay Crossing – DCO |
| Okanagan Lake – DOS | Tunnel – DOS | Pinaus Lake – DOS | Bolean Lake – DOS | Saskum Lake – DKA | Burnell (Sawmill) Lake – DO[illegible] |
| Davis Lake- DCS | Felker Lake – DCC | Lightning Creek – DQU | McGillivray Lake W. – DKA | Barnes Lake – DKA | Helmer Lake – DCS |
| Paska Lake – DKA | Kane Lake – DCS | Greeny Lake North – DMH | Little Slocan Lake – DAB | Cherryville – DOS | Johnny Lake – DCS |
| East Barriere Lake – DKA | Lambly (Bear) Lake – DOS | Pelican Lake – DQU | Greenbush Lake – DOS | Swalwell Lake – DOS | McDonald Lake – DOS |
| Skimikin Lake – DOS | Link Lake – DCS | Beaver (Holmes River) – DHW | Boat Lake – DQU | Raven Lake – DCC | Buck Lake |
| Campbell Lake – DKA | Tahla Lake – DCS | Sandy Point – DKA | **Beaverdam** | Ideal Lake – DOS | Lazy Lake – DRM |
| Sugar Lake 2 Mile – DOS | Red Bridge – DOS | | | **Tzenzaicut Lake N. – DQU** | Bluewater Creek – DCO |
| Duffy Lake – DKA | Jackpine Lake – DOS | | | | **Gwen Lake** |
| **Heffley Lake** | | | | | **Hen Ingram East – DCC** |
| | | | | | **Eagle Lake – DCH** |
| | | | | | **Glacier Creek N. – DKL** |
| | | | | | **Pinto Lake – DCH** |
| 11 | 10 | 8 | 8 | 9 | 14 |

22 Bolded entries signify site category changed.

## APPENDIX 4. OVERVIEW OF SURVEY QUESTIONS USED IN DATA ANALYSIS

### Brief Summary

| Code Definitions | Description | Estimators |
|---|---|---|
| A = sample total 120 | Where all sites have ONE recorded response | Estimated responses totals |
| B = sample total ‹ 120 | Where not all sites have the facility/ characteristic in question | Estimated response totals and total population estimate (ratio estimators used) |
| C = sample total › 120 | Where more than one unit/ characteristic exists per site | Estimated response totals and total population estimate (ratio estimators used) |
| D = length measurement | Where a total linear distance was measured for a given facility | Estimated distance totals and total "population" distance estimates (ratio estimators used) |

| Data Types | Description |
|---|---|
| Yes/No/None | Yes/No or None where unit/ characteristic was not present for evaluation |
| Coded (or None) | Codes differ depending on question |
| Scaled (1–8) | Scaled using "Reference 5 – Distribution code chart" |
| % estimates | No distinct categories; various subjective % estimates |
| # counts | Distinct number counts |
| length (m) | Total linear distance only |
| length – coded (m) | Total linear distance with a particular characteristic |
| Possible combinations | = 28 |

## Detailed Summary

| REPORT SECTION | Associated survey question | Data type | Code | Analysis considerations | Data reporting – description |
|---|---|---|---|---|---|
| **3.1 SITE SAFETY** | | | | | |
| 3.1.1 Natural hazards | 4.1 | Yes/No/None | B | not all sites have hazards present | On sites where natural hazards are present ONLY, proportion that are not clearly identified |
| | 4.2 | Coded (or None) | A | code options: L/O/RC/SC/OS/ UC/AC/NONE | Proportion of sites located on unstable ground or have unstable slopes above or below the site |
| | 4.3 | Yes/No/None | B | not all sites have trees | Of sites where past wildlife danger tree hazard assessments have been completed only, proportion of sites where recommendations have not been carried out |
| | | | | not all sites have hazard trees present | |
| | 4.4 | Yes/No/None | B | not all sites have trees | Proportion of sites with hazardous trees that require a full hazard tree evaluation (of treed sites only) |
| | | | | assume no = none in this case | |
| 3.1.2 Safety of campsite facilities | A3C6 | Yes/No | C | more than one unit per site | Estimated proportion of campsites that are unsafe to use |
| | | | | assume that data was recorded for all units on the recreation site | |
| | A1Q6 | Yes/No | C | more than one unit per site | Estimated proportion of toilets that are unsafe to use |
| | | | | assume that data was recorded for all units on the recreation site | |
| | A3T6 | Yes/No | C | more than one unit per site | Estimated proportion of tables that are unsafe to use |
| | | | | assume that data was recorded for all units on the recreation site | |
| | 6.9.3 | Yes/No | B | not all sites have a unit present | Estimated proportion of footbridges that are unsafe to use |

| REPORT SECTION | Associated survey question | Data type | Code | Analysis considerations | Data reporting – description |
|---|---|---|---|---|---|
| | | | | assume that data was recorded for all units on the recreation site | |
| | A3FR6 | Yes/No | C | more than one unit per site<br>assume that data was recorded for all units on the recreation site | Estimated proportion of fire rings that are unsafe to use |
| **3.2 SANITATION** | | | | | |
| 3.2.1 Garbage | 3.6 | Scaled (1–8) | A | scale ratings 1–3 pooled | Proportion of sites with a few occurrences or less of unsightly garbage |
| | | | | scale ratings 4–6 pooled | Proportion of sites with several occurrences of unsightly garbage spread throughout the site |
| | | | | scale ratings 7–8 pooled | Proportion of sites with unsightly garbage spread uniformly throughout the site |
| | 3.7 | Scaled (1–8) | A | scale ratings 1–3 pooled | Proportion of sites with a few occurrences or less of unsanitary garbage |
| | | | | scale ratings 4–6 pooled | Proportion of sites with several occurrences of unsanitary garbage spread throughout the site |
| | | | | scale ratings 7–8 pooled | Proportion of sites with unsanitary garbage spread uniformly throughout the site |
| | 3.8 | Scaled (1–8) | A | scale ratings 1–3 pooled | Proportion of sites with a few occurrences or less of broken glass |
| | | | | scale ratings 4–6 pooled | Proportion of sites with several occurrences of broken glass spread throughout the site |
| | | | | scale ratings 7–8 pooled | Proportion of sites with broken glass spread uniformly throughout the site |
| | 5.13 | Scaled (1–8) | A | scale ratings 1–3 pooled | Proportion of sites with a few occurrances or less of garbage on the shoreline |
| | | | | scale ratings 4–6 pooled | Proportion of sites with several occurrences of garbage spread along the shoreline |

| REPORT SECTION | Associated survey question | Data type | Code | Analysis considerations | Data reporting – description |
|---|---|---|---|---|---|
| | | | | scale ratings 7–8 pooled | Proportion of sites with unsanitary garbage spread uniformly along the shoreline |
| 3.2.2 Other waste | 3.1 | Scaled (1–8) | A | scale ratings 1–3 pooled | Proportion of sites with a few occurrences or less of human and/or domestic animal waste |
| | | | | scale ratings 4–6 pooled | Proportion of sites with several occurrences of human and/or domestic animal waste spread throughout the site |
| | | | | scale ratings 7–8 pooled | Proportion of sites with human and/or domestic animal waste spread uniformly throughout the site |
| | 3.2 | Coded | A | code options: H/DA/G/W/C/N<br>pooled all codes except N (=none) | Proportion of sites with presence of human waste |
| | 3.4 | Scaled (1–8) | A | scale ratings 1–8 pooled | Proportion of sites with presence of motor oil or other hazardous waste |
| | 3.5 | Scaled (1–8) | A | scale ratings 1–8 pooled | Proportion of sites with evidence of grey water disposal outside of designated facilities |
| 3.2.3 Toilets | A1Q7 | Scaled (1–5) | C | more than one unit per site | Proportion of toilets with problematic levels of offensive odour |
| | | | | no explanation of scale – inferred that rating of 4–5 was "problematic" | |
| | A1Q11 | Yes/No | C | more than one unit per site | NO TOILETS OVERFLOWING OR LEAKING! |
| | A1Q14 | Yes/No | C | more than one unit per site | Proportion of toilets where distance is LESS than 1.5 metres |
| | A1Q15 | Yes/No | C | more than one unit per site | Proportion of toilets with human waste on the toilet surface |
| | A1Q16 | Yes/No | C | more than one unit per site | Proportion of toilets with garbage inside |

| REPORT SECTION | Associated survey question | Data type | Code | Analysis considerations | Data reporting – description |
|---|---|---|---|---|---|
| **3.3 ENVIRONMENTAL QUALITY** | | | | | |
| 3.3.1 Site erosion | 2.5 | Coded | A | Codes: H/M/L/ None | Proportion of sites with low levels of ponding, rutting and erosion on the road system and/or parking area |
| | | | | | Proportion of sites with moderate levels of ponding, rutting and erosion on the road system and/or parking area |
| | | | | | Proportion of sites with high levels of ponding, rutting and erosion on the road system and/or parking area |
| | 5.7 | Coded | B | not all sites have trails | |
| | | | | Codes: H/M/L/ None | Proportion of sites with high erosion levels on the trail system |
| | | | | | Proportion of sites with moderate erosion levels on the trail system |
| | | | | | Proportion of sites with low erosion levels on the trail system |
| | A3C9 | Yes/No | C | more than one unit per site | Proportion of sites with visible signs of erosion on the campsite |
| 3.3.2 Forest health | 6.2a | % estimates | B | not all sites have trees | |
| | | | | responses from 0–25% pooled | Proportion of sites with 0–25% of trees showing signs of vandalism |
| | | | | responses from 25–50% pooled | Proportion of sites with 26–50% of trees showing signs of vandalism |
| | | | | responses › 50% pooled | Proportion of sites with over 50% of trees showing signs of vandalism |
| | 6.2b | | | responses averaged over all estimates | AVERAGE proportion (%) of trees vandalised per site |
| | 6.4a | % estimates | B | not all sites have trees | |
| | | | | responses from 0–25% pooled | Proportion of sites with 0–25% of trees showing signs of root damage |
| | | | | responses from 25–50% pooled | Proportion of sites with 26–50% of trees showing signs of root damage |
| | | | | responses › 50% pooled | Proportion of sites with over 50% of trees showing signs of root damage |

| REPORT SECTION | Associated survey question | Data type | Code | Analysis considerations | Data reporting – description |
|---|---|---|---|---|---|
| | 6.4b | | | responses averaged over all estimates | AVERAGE proportion (%) of trees vandalised per site |
| | 5.6b | Scaled (1–8) | C | more than one occurrence per site | |
| | | | | scale ratings 1–3 pooled | Invasive species limited to a few patches or one clustered patch (1–3) |
| | | | | scale ratings 4–6 pooled | Invasive species spread throughout with some clustered patches (4–6) |
| | | | | scale ratings 7–8 pooled | Invasive species spread uniformly throughout (7–8) |
| | 5.6a | | | # of incidences of a species/all incidences | Proportion of total incidences represented by individual invasive species |
| | 5.6c | # counts | A | Counts ranged from 1–4 occurrences per site | Proportion of sites with one invasive species present |
| | | | | | Proportion of sites with two invasive species present |
| | | | | | Proportion of sites with four invasive species present |
| | 5.1a | % estimates | B | not all sites have trees | |
| | | | | responses from 0–25% pooled | Proportion of sites with 0–25% of trees showing signs of root damage |
| | | | | responses from 25–50% pooled | Proportion of sites with 26–50% of trees showing signs of root damage |
| | | | | responses > 50% pooled | Proportion of sites with over 50% of trees showing signs of root damage |
| | 5.1b | | | responses averaged over all estimates | AVERAGE proportion (%) of trees vandalised per site |
| | 5.2 | Coded | B | not all sites have trees | |
| | | | | Codes: BB (bark beetle), OT (other infestation) | Proportion of infestations attributed to bark beetle |
| | 5.4a | % estimates | B | not all sites have trees | |

| REPORT SECTION | Associated survey question | Data type | Code | Analysis considerations | Data reporting – description |
|---|---|---|---|---|---|
| | | | | responses from 0–25% pooled | Proportion of sites with 0–25% of trees showing signs of root damage |
| | | | | responses from 25–50% pooled | Proportion of sites with 26–50% of trees showing signs of root damage |
| | | | | responses > 50% pooled | Proportion of sites with over 50% of trees showing signs of root damage |
| | 5.4b | | | responses averaged over all estimates | AVERAGE proportion (%) of trees vandalised per site |
| 3.3.3 Shoreline condition | 5.10 | # counts | B | not all sites have a shoreline | Sites with no user-made trails leading to the shoreline |
| | | | | | Sites with 1–5 trails leading to the shoreline |
| | | | | | Sites with 6–10 trails leading to the shoreline |
| | | | | | Sites with over 10 trails leading to the shoreline |
| | 5.11 | Yes/No | B | not all sites have a shoreline | |
| | | | | not all shorelines have user made trails | Proportion of sites with trails where trails require remedial action |
| **3.4 FACILITIES AND MAINTENANCE** | | | | | |
| 3.4.1 Current facilities | 2.2a | length (m) | D | not all sites have ditches | |
| | | | | total length of [facility] that is non-functional | Proportion of total ditch length that is non-functional |
| | 2.4 | Yes/No | B | not all sites have culverts | |
| | | | | Is the [facility] functional? | Proportion of culverts that are non-functioning |
| | 6.5.3 | Yes/No | B | not all sites have boat launches | |
| | | | | Is the [facility] functional? | Proportion of boat launches that are non-functioning |
| | A2DS5 | Coded | C | more than one unit per site | |
| | | | | Codes: At/ Above/Below | Proportion of directional signs that are BELOW MoFR standards |

| REPORT SECTION | Associated survey question | Data type | Code | Analysis considerations | Data reporting – description |
|---|---|---|---|---|---|
| | | | | totals of directional signs leading to the site AND within the site | |
| | A2K1 | Coded | B | not all sites have kiosks | |
| | | | | Codes: At/ Above/Below | Proportion of kiosks that are BELOW MoFR standards |
| | A3T4 | Coded | C | more than one unit per site | |
| | | | | Codes: At/ Above/Below | Proportion of tables that are BELOW MoFR standards |
| | A1Q3 | Coded | C | more than one unit per site | |
| | | | | Codes: At/ Above/Below | Proportion of toilets that are BELOW MoFR standards |
| | A2ES1 | Coded | C | more than one unit per site | |
| | | | | Codes: At/ Above/Below | Proportion of entrance signs that are BELOW MoFR standards |
| | A3FR4 | Coded | C | more than one unit per site | |
| | | | | Codes: At/ Above/Below | Proportion of fire rings that are BELOW MoFR standards |
| | 6.6.3 | Yes/No | B | not all sites have docks/wharves/ piers | |
| | | | | Is the [facility] functional? | Proportion of docks that are not functional |
| | 6.10.2 | Yes/No | B | not all sites have parking areas | |
| | | | | Is the [facility] functional? | Proportion of parking areas that are non-functional |
| | 6.8.2a | Coded | D | not all sites have fencing | Proportion of fencing that is below standard |
| | | | | total length of [facility] that is below MoFR standard | Total Length of fencing that is BELOW standard (m) |
| | 6.8.2b | | | | Average Length of fencing BELOW standard per site (m) |

| REPORT SECTION | Associated survey question | Data type | Code | Analysis considerations | Data reporting – description |
|---|---|---|---|---|---|
| 3.4.1 Remedial works required | 2.2b | length (m) | D | not all sites have ditches | Total length of ditches requiring repairs (m) |
| | | | | total length of [facility] that required remedial works | Average length of ditches requiring repairs per site (with ditches only) (m) |
| | 6.5.5 | Coded | B | not all sites have boat launches | Boat launches requiring major repairs (MA) |
| | | | | Codes: MA/MI/ PA/RE/RP/RR/ CL/NO/BR | Boat launches requiring removal or replacement (RE +RL+RP) |
| | | | | | Boat launches requiring other remedial works |
| | A2DS6 | Coded | C | more than one unit per site | Directional signs requiring major repairs (MA) |
| | | | | Codes: MA/MI/ PA/RE/RP/RR/ CL/NO/BR | Directional signs requiring removal or replacement (RE +RL+RP) |
| | | | | | Directional signs requiring other remedial works (MI + PA +CL +BR) |
| | A3K4 | Coded | B | not all sites have kiosks | Proportion of kiosks requiring major repairs (MA) |
| | | | | Codes: MA/MI/ PA/RE/RP/RR/ CL/NO/BR | Proportion of kiosks requiring removal or replacement (RE +RL+RP) |
| | | | | | Proportion of kiosks requiring other remedial works (MI + PA +CL +BR) |
| | A3T11 | Coded | | more than one unit per site | Proportion of tables requiring major repairs |
| | | | | Codes: MA/MI/ PA/RE/RP/RR/ CL/NO/BR | Proportion of tables requiring removal or replacement (RE +RL+RP) |
| | | | | | Proportion of tables requiring other remedial works (MI + PA +CL +BR) |
| | A1Q4 | Coded | C | more than one unit per site | Proportion of toilets requiring major repairs (MA) |
| | | | | Codes: MA/MI/ PA/RE/RP/RR/ CL/NO/BR | Proportion of toilets requiring removal or replacement (RE +RL+RP) |
| | | | | | Proportion of toilets requiring other remedial works (MI + PA +CL +BR) |

| REPORT SECTION | Associated survey question | Data type | Code | Analysis considerations | Data reporting – description |
|---|---|---|---|---|---|
| | A2ES2 | Coded | C | more than one unit per site<br>Codes: MA/MI/PA/RE/RP/RR/CL/NO/BR | Entrance signs requiring major repairs (MA)<br>Entrance signs requiring removal or replacement (RE +RL+RP)<br>Entrance signs requiring other remedial works (MI + PA + CL +BR) |
| | A3FR7 | Coded | C | more than one unit per site<br>Codes: MA/MI/PA/RE/RP/RR/CL/NO/BR | Proportion of fire rings requiring major repairs (MA)<br>Proportion of fire rings requiring removal or replacement (RE +RL+RP)<br>Proportion of fire rings requiring other remedial works (MI + PA + CL +BR) |
| | 6.6.4 | Coded | C | more than one unit per site<br>Codes: MA/MI/PA/RE/RP/RR/CL/NO/BR | Proportion of dock/wharf/piers requiring major repairs<br>Proportion of dock/wharf/piers requiring removal or replacement<br>Proportion of dock/wharf/piers requiring other remedial works |
| | 6.10.4 | Coded | B | not all sites have parking areas<br>Codes: MA/MI | Proportion of parking areas requiring major repairs (MA)<br>Proportion of parking areas requiring minor repairs (MI) |
| | 6.8.5 | length – coded (m) | D | not all sites have ditches<br>total length of [facility] that required remedial works – Codes: MA/MI/PA/RE/RP/RR/CL/NO/BR | Estimated total length of fencing requiring major repairs (MA)<br>Estimated total length of fencing requiring replacement (RE +RL+RP)<br>Estimated total length of fencing requiring other remedial works (PA) |
| | A3C11 | Coded | C | more than one unit per site<br>Codes: MA/MI/PA/RE/RP/RR/CL/NO/BR | Proportion of campsites requiring major repairs (MA)<br>Proportion of campsites requiring removal or replacement (RE +RL+RP)<br>Proportion of campsite requiring other remedial works (MI + PA + CL +BR) |

| REPORT SECTION | Associated survey question | Data type | Code | Analysis considerations | Data reporting – description |
|---|---|---|---|---|---|
| 3.4.2 Road works required | 1.3 | length (km) – coded | D | total length (km) | Length – roads requiring grading (km) |
| | | | | Codes: grading; cleaning and grading ditches; brushing; subgrade repair; gravelling | Length – cleaning and grading ditches (km) |
| | | | | | Length – brushing (km) |
| | | | | | Length – subgrade repair (km) |
| | | | | | Length – gravelling (km) |
| | 1.3 | length (km) – coded | D | proportion of total road length (%) | Proportion of roads requiring grading |
| | | | | Codes: grading; cleaning and grading ditches; brushing; subgrade repair; gravelling | Proportion of roads requiring cleaning and grading of ditches |
| | | | | | Proportion of roads requiring brushing |
| | | | | | Proportion of roads requiring subgrade repair |
| | | | | | Proportion of roads requiring gravelling |

| REPORT SECTION | Associated survey question | Data type | Code | Analysis considerations | Data reporting – description |
|---|---|---|---|---|---|
| 3.4.3 Additional facilities | A1Q2 | # counts | A | toilets | # of additional units required |
| | | | | | % increase |
| | A2ES3 | # counts | A | entrance signs | # of additional units required |
| | | | | | % increase |
| | A2K3 | # counts | A | kiosks | # of additional units required |
| | | | | | % increase |
| | A2DS2 | # counts | A | directional signs (leading to the site) | # of additional units required |
| | A2DS4 | # counts | A | directional signs (in the recreation site) | # of additional units required |
| | | | | | % increase |
| | A3C5 | # counts | A | campsites | # of additional units required |
| | | | | | % increase |
| | A3T3 | # counts | A | tables | # of additional units required |
| | | | | | % increase |
| | A3FR3 | # counts | A | fire rings | # of additional units required |
| | | | | | % increase |
| **3.5 SITE DESIGN** | | | | | |
| | 7.3 | Coded | A | Codes: E/G/M/P | Proportion of sites with excellent site design |
| | | | | | Proportion of sites with good site design |
| | | | | | Proportion of sites with moderate site design |
| | | | | | Proportion of sites with poor site design |

## APPENDIX 5. MINISTRY OF FORESTS AND RANGE RECREATION SITES BASELINE STANDARDS

The following ministry standards apply to Managed with Fees recreation sites and Managed without Fees sites:[23]

### *General Site Standards*

***Facilities***

| Required | Optional |
|---|---|
| • All structures maintained in a safe and fully operational condition<br>• Entrance sign meeting MoFR standard with a fourth blade displaying the type of site and/or the name of the agreement holder<br>• One pump-out toilet for every 6 defined campsites (camping pads)<br>• One pump-out toilet per campground designed to accommodate the disabled<br>• One campsite per campground designed to accommodate the disabled<br>• One table per campsite<br>• One anchored fire pit per campsite<br>• Gravelled or well-defined campsites<br>• Managed with fees sites must provide supervision, the extent of which is determined by the district, based on the following criteria:<br>– social – levels and patterns of use, past and potential problems<br>– seasonal – weather conditions, fire hazard, long weekends, special events<br>– environmental – site features and sensitivity, weather conditions<br>– geographic – proximity to communities and other facilities<br>– physical – site design and development, traffic/security control features. | • A minimum of 20 campsites; however, a smaller number of campsites is acceptable in some areas of the province<br>• Gate<br>• Boat launch<br>• Dock/wharf<br>• Shed for operator<br>• Provision of wood<br>• Wood corral<br>• Tent pads<br>• Garbage cans/garbage collection<br>• Animal proof food caches<br>• Highway signs<br>• Grey water disposal<br>• In-site trails |

23 This appendix was compiled by members of the Recreation Site Effectiveness Evaluation Working Group based on consultation with regional and district staff. Official ministry standards for recreation sites and facilities are provided in Appendix 2 of the *Recreation Manual* at: www.tsa.gov.bc.ca/publicrec/manual/appen02.htm#A2.1 (last updated in 1991). For up-to-date recreation site standards, contact the Recreation Sites and Trails Section at the Ministry of Tourism, Sport and the Arts (http://www.tsa.gov.bc.ca/publicrec/index.htm#top).

*Site Maintenance*

| Required | Optional |
|---|---|
| • Areas surrounding structures are kept free of weeds, encroaching vegetation, overhanging limbs, litter, garbage and other debris. Brush, grass and other vegetation that is around picnic tables or that otherwise interferes with the use of structures is cut.<br>• Campsites and surrounding area are maintained in a clean and tidy condition, free of litter, garbage, broken glass and other foreign material.<br>• Campsites and driveway shoulders are raked to remove wood chips, needles, sticks/branches and other debris.<br>• Agreement holders must provide maintenance at the frequency specified in the user agreement. | |

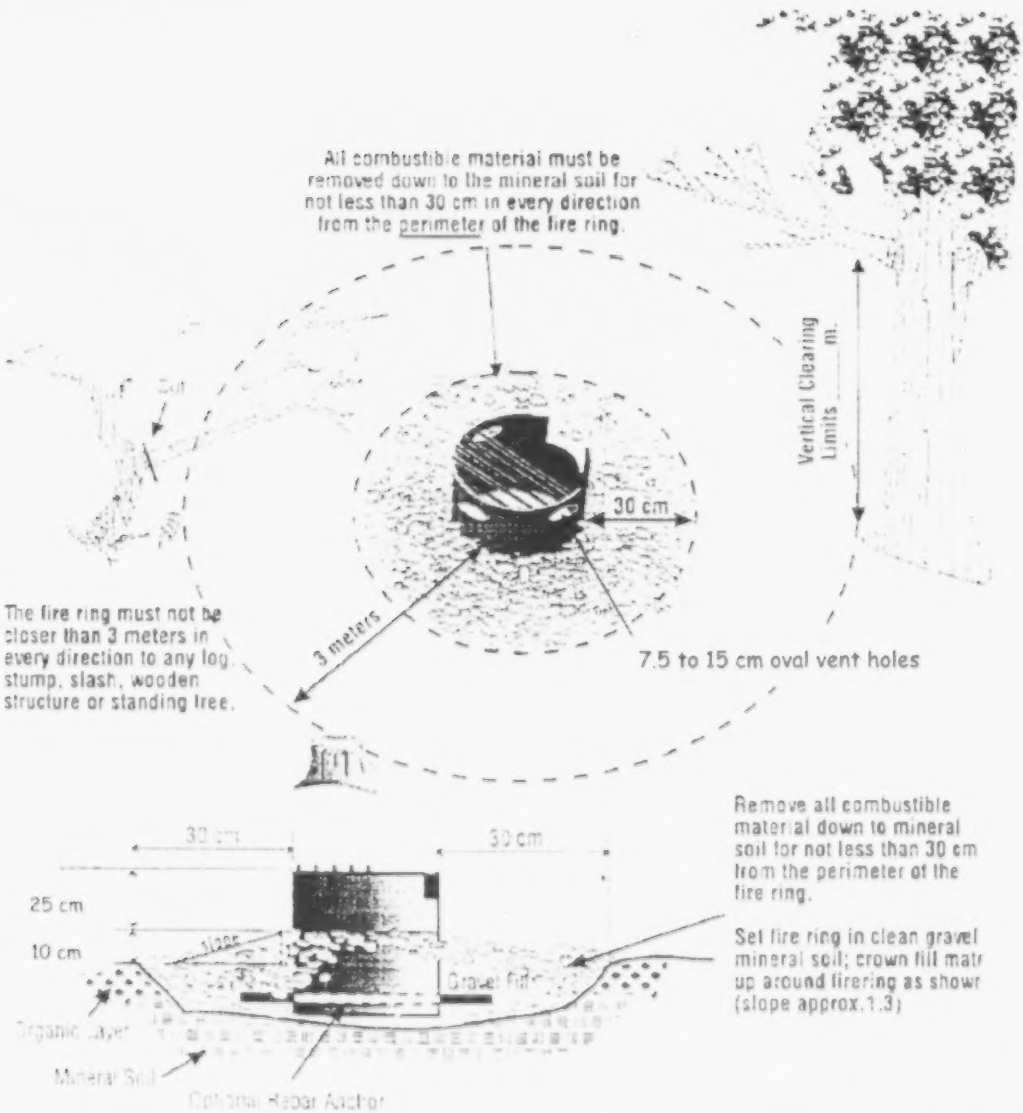
## *Campground Facilities, Structures & Sign Design, and Maintenance Standards*

***Fire rings***

- Keep fire pits free of litter, garbage, burnt residue and unused wood.
- Ensure the immediate area around fire pits is kept free of litter, garbage, encroaching vegetation and other debris.
- Remove cold ashes deeper than 10 centimetres and dispose at a regional dumpsite or transfer station.
- Extinguish non-attended fires immediately.
- Place rocks around the perimeter of designated fire pits if no metal fire ring is in place.
- Dismantle undesignated rock fire rings by removing the ashes, scattering the rocks and raking the spot. Remove excess rocks from the site and scatter in inconspicuous locations. Note: there should be one fire ring per table.

Fire rings shall be made of metal/steel. The drawing below shows a one cut air vent design. In some cases, districts have found that a three oval vent hole design, (drawing at branch office), provides better ventilation for a fire. Each oval vent hole measures 3 to 6 inches (approximately 7.5 to 15 cm) long by about 2 inches (5 cm) in height.

# Fire Ring Placement


All combustible material must be removed down to the mineral soil for not less than 30 cm in every direction from the perimeter of the fire ring.
Vertical Clearing Limits m.
30 cm
3 meters
The fire ring must not be closer than 3 meters in every direction to any log, stump, slash, wooden structure or standing tree.
7.5 to 15 cm oval vent holes
30 cm
30 cm
25 cm
10 cm
Gravel Fill
Mineral Soil
Optional Rebar Anchor
Remove all combustible material down to mineral soil for not less than 30 cm from the perimeter of the fire ring.
Set fire ring in clean gravel mineral soil; crown fill mate up around firering as shown (slope approx.1:3)

## Picnic Tables

### Design

Tables shall be of a log/plank design at Managed with Fees recreation sites. Concrete tables are an acceptable alternative where circumstances warrant their use. Log/plank table standards include:

- Large-log (old style) and small-log (newer style) designs can be used;
- Logs must have straight cut ends;
- Planned planks are required to have a thickness between 5–10 cm;
- Table shall be stained with a "Russet" or chocolate brown stain color. Note that General Paints Solid Latex Stain (72-016) can be made "Russet" in colour (this is a General Paints standard "chocolate brown" available off the shelf as a pre-mix formulation);
- Table design can be modified to be handicapped accessible by extending top plank by an additional 75 cm or so to accommodate a wheelchair; and
- Table must be placed on the gravelled campsite or on a table pad.

### Maintenance

- Repair or replace missing or damaged picnic tables.
- Ensure tables are safe by securing loose planks and removing all splinters, nails and other hazards. Make sure tables are level and not prone to rocking or tipping when used.
- Paint/stain tabletops and seat planks as necessary to maintain surfaces using the existing colour scheme.
- After maintenance, relocate tables to their original locations and level as necessary.
- Maintain tables and the immediate area in a clean condition, free of cobwebs, grass/brush, litter, garbage and other debris.
- Make sure tables are level and not prone to rocking or tipping when used.
- Paint/stain tabletops and seat planks as necessary to maintain surfaces using the existing colour scheme.

## Outhouses

### Design

"Regular" outhouses at Managed with Fees recreation sites must be vaulted and shall be of a wood design based on the existing specifications found in the *Recreation Manual* (note that handicapped accessible outhouses have additional specification requirements). Concrete outhouses are an acceptable alternative where circumstances warrant their use. Regular outhouse standards include:

- A vent pipe made of a minimum of 6" black pipe (8" is better) on the outside are important in odour control. Place the vent pipe on the south facing wall (the sun will warm the pipe, which will promote venting). No vents on low end of roof where snow tends to break off the pipe.
- Sides made of "exterior horizontal or vertical siding" or "plywood" sheeting, depending on the porcupine problem.
- Toilet must be painted green. Green stain should be a darker "Forest" green. Note that General Paints Solid Colour Latex Stain (Latex Clear base 72-054) can be made green with the colour formulation (for a 3.78 L pail): AX3Y B2Y24 D4Y24 KX1Y.
- A sloping flat roof design.

**NOTE:** Contact Forest Practices Branch for a design of a handicapped accessible outhouse. (Please remember that for handicapped accessible outhouses the door needs to open inward.)

***Maintenance***

- Maintain pit toilet buildings and fixtures in a safe and fully functional condition.
- Keep pit toilets and fixtures clean and sanitary, free of dust, dirt, stains, mould, cobwebs, graffiti, litter, garbage, excess water, unpleasant odours and all foreign material.
- Thoroughly clean and sanitize toilet seats, stems and floors with a mixture of cleaner and water. Do not pour water used for toilet sanitizing/disinfecting into the pit.
- Supply toilet paper and deodorant blocks as required.
- Apply septic enzyme as required, following product instructions (lime products should not be used).
- Keep the area surrounding the pit toilet building free of litter, garbage, debris, weeds, encroaching vegetation and overhanging limbs. Remove all debris from the roof surface.
- Maintain the minimal acceptable space of 1.5 feet (0.5 metres) between faecal matter and the floor level by pumping the toilet as required.
- When required, stain or paint the outside and inside walls of the toilet as well as the floor in the existing colour scheme. Paint the floors with grey porch enamel. Protect the toilet seat and stem from marring and splatters while the interior of the structure is painted.

## *Signage*

There must be common wording, and placement of signs and posters, at Managed with Fees recreation sites.

***Design***

- Sign material should be made of wood and include:
  - fee charges and requirements;
  - maximum party size;
  - vehicle and parking policy;
  - quiet hours; and
  - check out time.
- Colour must be a "Russet" brown background and white lettering.
- All entrance signs require a fourth blade listing the type of site and the agreement holder (if the site is not user maintained).

The following letter sizes are to be used:

| | |
|---|---|
| 3" | Sign Header (e.g.,Welcome to _____ Forest Service Recreation Site) |
| 2" | Sign Sub-header (e.g., Our Camping Policy) |
| 1½" | Text (e.g., Please select a campsite. The Daily Fee for Service fee is $_____/party. An attendant will collect the fee.) |

***Example of a Managed with Fees Recreation Site Sign***

Welcome to the
Warm and Sunny Beach
Forest Service Recreation Site

Please select a campsite. The Daily Fee is $10.00/party or $5.00/party for seniors or disabled persons. An attendant will collect the fee.

Our Camping Policy

Camping Party

A family group from the same residence or a maximum of 6 people, 13 years of age or older.

Vehicles

Maximum one vehicle per party, unless the vehicle is towed or is a commuter vehicle. Additional vehicle requires payment of an additional camping pass. All vehicles are to kept on existing roads, parking areas and campsites.

Check Out

Check out time is noon.

Maximum Stay

Maximum length of stay is 14 days.

*Enjoy your stay.*

BRITISH COLUMBIA

***Maintenance***

- Ensure signs are in good repair and maintained in a firm vertical position, with the sign message oriented to provide maximum viewing exposure.
- Stain and paint signs as required.
- Replace or repair all missing or damaged signs.

## *Sign Kiosks*

Sign kiosks reduce clutter and avoid placing signs on trees. Three kiosk designs are acceptable (contact branch office for more information):

a. 6×6-post design, 48" wide, with roof (standard drawing available).

b. 6×6 post design, 48" wide, without roof (standard drawing needs to be developed).

c. 6×6-post design, 96" wide, with roof (standard drawing available).

Kiosk standards include:

- Colour must be "Russet" brown for the posts and backboard, and a green metal roof.
- It is mandatory that the following information and poster(s) be posted on all kiosks:
  - The Recreation Rules Poster; and
  - Information about the district, the campground itself, where to get more information, a fees message, emergency contacts, and the Ministry of Forests and Range and the Province of BC logos.

### *Highway Signs*

The use of a highway directional sign may be appropriate to help direct campers to a managed recreation site. The sign must adhere to Ministry of Transportation standards to ensure a consistent design and appearance for highway signs throughout the province. Recreation site signs should follow the same style, format and layout as a BC provincial park sign with one exception – BC provincial park signs are blue and recreation sites signs are green (see the previous section on outhouses for the green paint formulation).

### *Campsite Number Posts*

Agreement holders have flexibility in campsite number post design and placement so long as they are easily visible from the road and compliment the design and aesthetics of the campsite.

### *Boat Launches*

There are two types of boat launch facilities – boat launch ramps designed for loading and unloading power boats on trailers, and boat launch areas for loading and unloading small boats by hand. Boat launch facilities should be located adjacent to, but separate from, overnight campgrounds and day-use areas.

**Note:** There should be no direct vehicle access from the boat launch to overnight campgrounds or day-use areas.

Site criteria for boat launch facilities include:

- Shelter from prevailing winds and strong currents;
- Sufficient depth of water, even during periods when water levels are low;
- Ample separation between boat launch ramps and swimming areas;
- Slope at water entry to be less than 10% for by-hand boat launch areas, and between 10% and 15% for boat trailer launch ramps; and
- Access to rivers should be located at safe eddies.

Boat launch facilities should follow the same construction standards as outlined for roads. Layouts and dimensions of vehicle turn-arounds are critical. A 30-metre minimum setback from the edge of turn-arounds to the high water level is preferred. However, the detached ramp turn-around may have insufficient backshore area to meet that standard, in which case a 30-metre minimum setback to the centre point of the turn-around is allowed. The total parking area required should be determined by anticipated demand. A boat beaching area (1.5 m × number of parking stalls) should be developed adjacent to the launch area; docks may be provided.

The total parking area required is determined by anticipated demand. Vehicle access should be limited to a double back-in spur (8 metres wide × 10 metres deep) extending from the vehicle turn-around towards the water. Vehicle barriers (preferably rocks) will restrict further access to the water. Remaining pedestrian access to the water, beyond the back-in spur, should be restricted to a four-metre trail.

### *Trail Maintenance Within A Site*

1. **Deadfall** – Cut out all blowdown/deadfall over the trail, remove wood a minimum of 0.5 metre from the tread centre and dispose downhill when possible.
2. **Brushing** – Remove all juvenile trees and woody brush for 0.5 metre on either side of tread centre within 3.0 centimetres of ground level. Scatter the cut material out of sight of the trail.
3. **Limbing** – Remove tree limbs to allow 2.5 metres of overhead clearance above the trail, with 1.0–1.5 metres total clearance width. Scatter cut limbs a minimum of 3.0 metres from the trail edge, out of sight where possible. Ensure limbing cuts are clean, without scarring the main trunk of the tree.
4. **Tread surface** – Ensure the tread surface of the trail provides a stable walking surface of not less than 40 centimetres in width.
5. **Erosion control** – Clean and repair any existing water bars and ditches as necessary to drain water away from the trail and prevent erosion.
6. **Route marking** – Mark obscure routes with cairns or delineating tags as required.
7. **Litter cleanup** – Remove litter and garbage at the trailhead, along the trail, and at any associated camping areas.

### *Firewood*

The provision of firewood is optional at managed recreation sites. Decision options include:

1. No firewood provided;
2. Firewood provided at no additional charge; and
3. Firewood provided at an additional charge. The fee for firewood must be based on a price ranging from $2.00 to $4.00 per bundle.

The variation in the provision of firewood at managed recreation sites may be confusing to the public. The ministry should consider setting up provincial standards regarding the provision of firewood.

### *Firewood Corrals*

Firewood corrals are optional and construction standards are flexible depending on the discretion of the agreement holder. All firewood corrals should be structurally sound with no evidence of rot, loose boards or posts, protruding nails, or any other safety hazard. The corrals must also fit in with the theme of the recreation site and all aesthetic and design principles. Corrals should be made of wood or perhaps concrete if circumstances such as vandalism or heavy use warrant the investment.

Suggested guidelines for firewood corrals:

- Size: 7' × 7' × 3'.
- Corrals should be fenced on three sides using 9' 3" × 8' rough sawn planks measuring 7' in length. The remaining side should be left open.
- Corrals require four pressure treated posts with dimensions 6' × 6' × 5', of which 1'10" of the height of the post will be placed in the ground.

## *Garbage Containers and Collection (if provided at the site)*

- Ensure all garbage containers are in good repair, fully functional and have a lid or are otherwise enclosed.
- Keep garbage containers in a clean and sanitary condition, free of stains and offensive odours. Wash the inside and outside of containers as required.
- Empty garbage containers before they become overfull, and dispose of the garbage at a refuse dump or transfer station operating in accordance with provincial laws and regulations. Replace garbage bags as necessary.
- Ensure the area surrounding garbage containers is free of litter, garbage, weeds and other debris.
- Replace non-serviceable garbage containers as soon as possible.
- Keep garbage containers in a centralized area or in convenient locations throughout the site.

## *Barriers*

There are two types of barriers in recreation sites – barriers for traffic control and barriers for safety. There is some flexibility in barrier design beyond the designs suggested below; however, all designs must fit with the aesthetic and design principles of the site and be soundly constructed, posing no threat to the safety of visitors.

Suggested designs:

| Barriers for Traffic Control | | Safety Barriers | |
|---|---|---|---|
| Rocks | Rocks with a mass greater than roughly one cubic metre are placed in the ground at a depth of approximately 30 cm. The rocks should be placed close enough to each other to prevent all vehicles and ATVs from getting into the area the barrier is protecting. | Fence #1 | Pressure treated vertical posts 20–25 cm (8–10 inches) in diameter pounded into the ground 1–2 m (4–6 ft) apart, with 3 horizontal logs/lumber attached to the posts. |
| Fence | The fence is composed of treated posts 13 cm (5 inches) to 20 cm (8 inches) in diameter placed vertically in rows 2 to 2.5m (6 to 8 feet) apart. Logs or lumber are fastened to the posts, with a break every 6 m (20 ft). | Fence#2 | Pressure treated vertical posts 20–25 cm (8-10 inches) in diameter pounded into the ground 1–2 m (4–6 ft) apart. Horizontal boards are fastened onto the posts. |
| Posts | Treated posts with a minimum diameter of 20 cm (10 inches) placed vertically in rows 1–2 m (4–6 ft) apart. | | |
| Logs | Logs with a diameter of 30–40 cm (12–16 inches) and a length of 3.5 m (12 ft) are placed on base logs with a length of approximately 0.5 m (2 ft). | | |

## APPENDIX 6. RAW ANALYSIS SUMMARY TABLES: DETAILED RESULTS

| | | Proportion of Recreation Sites (%) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Site type | | | Region | | | |
| Q | 3.1.1 Hazards | MWF | MWOF | UM | CFR | NIR | SIR | All sites |
| 4.1 | Natural Hazards Present | 16.3 | 13.1 | 3.6 | 20.4 | 5.5 | 5.6 | 7.5 |
| 4.1 | *On the sites where they are present only,* natural hazards are not clearly identified | 24.6 | 87.5 | 100.0 | 66.8 | 100.0 | 72.5 | 75.1 |
| 4.2 | Sites located on unstable ground or have unstable slopes above or below the site | 4.0 | 2.0 | 0.0 | 6.8 | 0.0 | 0.1 | 1.0 |
| 4.3 | *Of sites where past wildlife danger tree hazard assessments have been completed only,* recommendations have not been carried out | 23.0 | 55.8 | 60.9 | 19.8 | 51.0 | 60.9 | 53.2 |
| 4.4 | Presence of hazardous trees that require a full hazard tree evaluation | 61.7 | 63.2 | 71.6 | 71.8 | 60.4 | 70.5 | 68.3 |

| | | Proportion of Recreation Sites (%) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Site type | | | Region | | | |
| Q | 3.1.2 Safety of Campsite Facilities | MWF | MWOF | UM | CFR | NIR | SIR | All sites |
| A3C6 | campsites | 0.5% | 4.1% | 1.3% | 0.3% | 1.3% | 2.4% | 1.8% |
| | CI (±) | 0.6% | 5.1% | 1.9% | | | | 1.6% |
| A1Q6 | toilets | 3.2% | 9.6% | 5.3% | 6.9% | 3.6% | 6.6% | 6.1% |
| | CI (±) | 2.3% | 16.9% | 6.7% | | | | 5.9% |
| A3T6 | tables | 2.6% | 13.3% | 8.9% | 6.4% | 18.0% | 5.4% | 8.1% |
| | CI (±) | 1.8% | 12.0% | 5.7% | | | | 3.8% |
| 6.9.3 | footbridges | 16.3% | 0.0% | 0.0% | 0.0% | 0.0% | 31.3% | 8.3% |
| | CI (±) | 26.1% | 0.0% | 0.0% | | | | 14.7% |
| A3FR6 | fire rings | 10.7% | 17.6% | 14.9% | 9.6% | 21.4% | 13.8% | 14.4% |
| | CI (±) | 5.4% | 15.8% | 8.7% | | | | 5.9% |

| | | Proportion of Recreation Sites (%) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Site type | | | Region | | | |
| Q | 3.2.1 Garbage | MWF | MWOF | UM | CFR | NIR | SIR | All sites |
| | Unsightly garbage | | | | | | | |
| 3.6 | All unsightly garbage | 79.8 | 72.4 | 99.5 | 79.2 | 92.4 | 91.9 | 90.4 |
| 3.6 | A few occurrences or less (code 1–3) | 74.5 | 62.0 | 74.0 | 67.7 | 75.8 | 70.0 | 71.1 |
| 3.6 | At least several occurances (code 4–6) | 4.1 | 2.0 | 25.5 | 11.5 | 16.6 | 18.4 | 17.1 |
| 3.6 | spread uniformly throughout the site (code 7–8) | 1.2 | 8.3 | 0.0 | 0.0 | 0.0 | 3.5 | 2.2 |
| | Unsanitary garbage | | | | | | | |
| 3.7 | All unsanitary garbage | 21.3 | 13.7 | 35.5 | 30.9 | 14.4 | 32.8 | 28.3 |
| 3.7 | A few occurrences or less (code 1–3) | 21.3 | 13.3 | 31.1 | 30.9 | 14.4 | 28.3 | 25.4 |
| 3.7 | At least several occurances (code 4–6) | 0.0 | 0.4 | 4.4 | 0.0 | 0.0 | 4.5 | 2.9 |
| | Broken glass | | | | | | | |
| 3.8 | All broken glass on the site | 61.3 | 27.6 | 57.9 | 64.6 | 22.1 | 58.1 | 50.7 |
| 3.8 | A few occurrences or less (code 1–3) | 60.1 | 27.2 | 46.7 | 64.6 | 16.6 | 48.7 | 43.4 |
| 3.8 | At least several occurances (code 4–6) | 1.2 | 0.4 | 11.2 | 0.0 | 5.5 | 9.4 | 7.3 |
| | Garbage on the shoreline | | | | | | | |
| 5.13 | All garbage present on the shoreline area | 62.6 | 36.0 | 53.8 | 69.3 | 47.1 | 48.2 | 50.7 |
| 5.13 | A few occurrences or less (code 1–3) | 39.7 | 34.8 | 50.1 | 65.2 | 47.1 | 40.6 | 44.9 |
| 5.13 | At least several occurances (code 4–6) | 3.7 | 9.3 | 4.9 | 4.0 | 0.0 | 7.6 | 5.8 |

| | | Proportion of Recreation Sites (%) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Site type | | | Region | | | |
| Q | 3.2.2 Dangerous Waste | MWF | MWOF | UM | CFR | NIR | SIR | All sites |
| | Human and/or animal waste | | | | | | | |
| 3.1 | A few occurrences or less (code 1–3) | 36.9 | 31.2 | 47.5 | 43.9 | 23.2 | 46.5 | 40.8 |
| 3.1 | At least several occurances (code 4–6) | 6.2 | 13.4 | 5.4 | 0.0 | 0.0 | 12.6 | 8.1 |
| 3.1 | spread uniformly throughout the site (code 7–8) | 4.5 | 0.3 | 10.5 | 0.0 | 0.0 | 10.0 | 6.4 |
| 3.1 | Alll waste outside of toilet facilities | 40.9 | 16.6 | 81.9 | 43.9 | 23.2 | 69.1 | 55.3 |
| | Human waste only | | | | | | | |
| 3.2 | Proportion of sites with presence of human waste | 9.3 | 7.4 | 6.0 | 23.5 | 2.4 | 4.9 | 6.7 |
| | Motor oil or other hazardous waste | | | | | | | |
| 3.4 | Proportion of sites with presence of motor oil or other hazardous waste | 0.0 | 2.0 | 2.0 | 3.1 | 5.5 | 0.1 | 1.8 |
| | Grey water outside of designated faciltiies | | | | | | | |
| 3.5 | A few occurrences or less (code 1–3) | 1.2 | 0.4 | 0.0 | 0.0 | 0.0 | 0.4 | 0.2 |
| 3.5 | At least several occurances (code 4–6) | 0.0 | 0.0 | 4.6 | 0.0 | 0.0 | 4.6 | 2.9 |
| 3.5 | All grey water disposal | 1.2 | 0.4 | 4.6 | 0.0 | 0.0 | 5.0 | 3.1 |

| | | Proportion of Recreation Sites (%) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Site type | | | Region | | | |
| Q | 3.2.3 Toilets | MWF | MWOF | UM | CFR | NIR | SIR | All sites |
| A1Q11 | Toilets overflowing or leaking | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| A1Q7 | Toilets with problematic levels of offensive odour* | 17.0 | 6.3 | 0.0 | 3.2 | 22.1 | 10.3 | 12.1 |
| A1Q14 | Proportion of toilets where distance is less than 1.5 metres | 16.9 | 11.1 | 4.2 | 14.3 | 13.5 | 13.3 | 13.6 |
| A1Q15 | Human waste on the toilet surface | 9.9 | 7.3 | 0.0 | 5.3 | 13.1 | 5.5 | 7.5 |
| A1Q16 | Garbage in the toilet | 37.2 | 15.8 | 10.9 | 25.0 | 37.2 | 26.1 | 28.9 |

| | | Proportion of Recreation Sites (%) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Site type | | | Region | | | |
| Q | 3.3.1 Erosion | MWF | MWOF | UM | CFR | NIR | SIR | All sites |
| | Road system and/or parking area | | | | | | | |
| 2.5 | All sites (N = 1187) | 61.1 | 77.5 | 80.9 | 77.2 | 60.7 | 80.2 | 77.7 |
| | CI (±) | 18.4 | 33.7 | 26.2 | 24.8 | 24.2 | 27.4 | 18.7 |
| 2.5 | High | 6.6 | 10.4 | 8.8 | 3.1 | 0.0 | 13.4 | 9.0 |
| 2.5 | Moderate | 9.3 | 19.9 | 30.3 | 24.1 | 10.7 | 30.0 | 25.2 |
| 2.5 | Low | 45.2 | 47.2 | 41.7 | 50.0 | 50.0 | 36.9 | 43.5 |
| | Trails | | | | | | | |
| 5.7 | All sites with trails (N = 747) | 64.6 | 74.7 | 55.6 | 76.6 | 23.4 | 66.6 | 62.5 |
| | CI (±) | 17.4 | 23.4 | 26.0 | 15.7 | 30.4 | 20.2 | 16.2 |
| 5.7 | High | 1.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.3 | 0.2 |
| 5.7 | Moderate | 12.2 | 2.3 | 2.6 | 30.3 | 0.0 | 0.6 | 4.0 |
| 5.7 | Low | 51.0 | 72.4 | 53.1 | 46.3 | 23.4 | 65.7 | 58.2 |
| | Campsites | | | | | | | |
| A3C9 | All campsites (N = 7980) | 6.7 | 9.6 | 21.0 | 13.8 | 5.4 | 17.0 | 14.3 |
| | CI (±) | 4.5 | 7.6 | 18.8 | 8.0 | 5.4 | 14.6 | 9.6 |

| | | Proportion of Recreation Sites (%) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Site type | | | Region | | | |
| Q | 3.3.2a Tree Damage | MWF | MWOF | UM | CFR | NIR | SIR | All sites |
| | **Tree Vandalism** | | | | | | | |
| 6.2 | 0–25% | 86.6 | 68.8 | 69.0 | 89.2 | 89.3 | 60.8 | 71.0 |
| 6.2 | 26–50% | 2.5 | 0.3 | 19.7 | 0.7 | 5.5 | 17.9 | 12.9 |
| 6.2 | > 50% | 9.7 | 12.5 | 1.9 | 10.1 | 3.3 | 5.3 | 5.5 |
| | Totals | 98.7 | 81.7 | 90.6 | 100.0 | 98.1 | 84.0 | 89.3 |
| 6.2 | Average per site | 17.8 | 16.4 | 14.5 | 19.4 | 11.7 | 15.8 | 15.4 |
| | **Root Damage** | | | | | | | |
| 6.4 | 0–25% | 37.2 | 36.8 | 36.3 | 36.4 | 61.2 | 27.7 | 36.5 |
| 6.4 | 26–50% | 5.3 | 0.4 | 4.4 | 3.7 | 0.0 | 4.7 | 3.5 |
| 6.4 | > 50% | 0.0 | 1.6 | 1.4 | 10.1 | 0.0 | 0.0 | 1.3 |
| | Totals | 42.6 | 38.8 | 42.1 | 50.2 | 61.2 | 32.4 | 41.3 |
| 6.4 | Average per site | 4.3 | 4.5 | 4.7 | 10.7 | 3.5 | 3.8 | 4.6 |

| | | Proportion of Recreation Sites (%) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Site type | | | Region | | | |
| Q | 3.3.2b Invasive Species | MWF | MWOF | UM | CFR | NIR | SIR | All sites |
| | **Number of Species** | | | | | | | |
| 5.6 | 1 invasive species present | 24.4 | 10.2 | 15.4 | 9.0 | 0.9 | 21.5 | 15.1 |
| 5.6 | 2 invasive species present | 9.5 | 0.0 | 4.4 | 0.0 | 0.0 | 6.1 | 3.9 |
| 5.6 | 4 invasive species present | 4.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.8 | 0.5 |
| | **Distribution** | | | | | | | |
| 5.6 | All invasive species | 38.0 | 10.2 | 19.8 | 9.0 | 0.9 | 28.3 | 19.5 |
| 5.6b | A few occurrences or less (code 1–3) | 14.6 | 0.7 | 6.1 | 9.0 | 0.9 | 7.0 | 6.0 |
| 5.6b | At least several occurances (code 4–6) | 34.6 | 9.5 | 8.6 | 0.0 | 0.0 | 18.8 | 12.4 |
| 5.6b | spread uniformly throughout the site (code 7–8) | 0.0 | 0.0 | 8.5 | 0.0 | 0.0 | 8.0 | 5.3 |

| | | Proportion of Recreation Sites (%) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Site type | | | Region | | | |
| Q | 3.3.2c Tree Health | MWF | MWOF | UM | CFR | NIR | SIR | All sites |
| | **Pest Infestation – proportion of on-site trees** | | | | | | | |
| 5.1 | All sites | 29.3 | 35.5 | 41.9 | 14.5 | 55.1 | 37.9 | 38.9 |
| 5.1 | 0–25% | 28.6 | 5.8 | 24.9 | 14.5 | 27.8 | 19.1 | 20.5 |
| 5.1 | 26–50% | 0.7 | 10.5 | 10.5 | 0.0 | 19.4 | 7.6 | 9.4 |
| 5.1 | › 50% | 0.0 | 19.2 | 6.6 | 0.0 | 7.9 | 11.2 | 9.0 |
| 5.1 | AVERAGE proportion (%) of trees with pest infestation per site | | | | 23.8 | 35.8 | 28.9 | 30.3 |
| | **Bark Beetle Infestation – proportion of on-site trees** | | | | | | | |
| 5.2 | Proportion of sites with bark beetle infestation | 21.3 | 34.4 | 39.1 | 0.0 | 55.1 | 36.2 | 35.9 |
| | **Root/Heart Rot – proportion of on-site trees** | | | | | | | |
| 5.4 | All sites | 13.7 | 9.2 | 20.7 | 26.9 | 17.7 | 14.7 | 17.0 |
| 5.4 | 0–25% | 12.0 | 9.2 | 19.2 | 18.5 | 17.7 | 14.7 | 15.9 |
| 5.4 | 26–50% | 1.7 | 0.0 | 1.4 | 8.4 | 0.0 | 0.0 | 1.1 |
| 5.4 | AVERAGE proportion (%) of trees with heart and/or root rot per site | | | | 15.3 | 8.3 | 10.2 | 10.0 |

| | | Proportion of Recreation Sites (%) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Site type | | | Region | | | |
| Q | 3.3.3 Shoreline Condition | MWF | MWOF | UM | CFR | NIR | SIR | All sites |
| | **User-made Trails Leading to the Shoreline** | | | | | | | |
| 5.10 | Any user-made trails | 80.2 | 58.9 | 70.3 | 71.5 | 53.4 | 71.9 | 68.4 |
| 5.10 | 0–5 trails | 72.5 | 52.4 | 65.3 | 67.3 | 46.6 | 66.2 | 62.7 |
| 5.10 | 5–10 trails | 5.6 | 6.4 | 4.8 | 4.2 | 6.3 | 5.3 | 5.3 |
| 5.10 | › 10 trails | 2.2 | 0.0 | 0.2 | 0.0 | 0.5 | 0.4 | 0.4 |
| | **User-made Trails Leading to the Shoreline Requiring Remedial Action** | | | | | | | |
| 5.11 | Proportion of sites with trails where trails require remedial action | 13.0 | 22.7 | 4.6 | 33.1 | 1.8 | 7.2 | 9.8 |

| | | Proportion of Recreation Sites (%) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Site type | | | Region | | | |
| Q | 3.4.1 Current Facilities | MWF | MWOF | UM | CFR | NIR | SIR | All sites |
| | **Is the [Facility] Functional?** | | | | | | | |
| 6.5.3 | Proportion of boat launches that are non-functional | 7.0 | 0.0 | 4.1 | 7.0 | 0.0 | 4.1 | 3.6 |
| | CI (±) | 9.2 | 0.0 | 7.9 | 2.9 | 16.9 | 0.0 | 5.5 |
| 6.10.2 | Proportion of parking areas that are non-functional | 3.7 | 0.0 | 6.2 | 3.2 | 12.0 | 0.6 | 4.6 |
| | CI (±) | 0.6 | 0.0 | 9.4 | 2.8 | 18.7 | 0.4 | 6.1 |
| 2.4 | Proportion of culverts that are non-functional | 13.7 | 6.4 | 27.5 | 16.6 | 0.0 | 20.9 | 18.7 |
| | CI (±) | 21.7 | 13.4 | 43.1 | 20.7 | 0.0 | 34.8 | 24.6 |
| 6.6.3 | Proportion of docks that are not functional | 36.3 | 7.7 | 32.3 | 17.2 | 44.0 | 31.4 | 31.6 |
| | CI (±) | 37.0 | 14.3 | 38.3 | 19.2 | 58.2 | 48.3 | 29.0 |
| | **Is the [Facility] At, Above, or Below MoFR Standards?** | | | | | | | |
| A2DS5 | Proportion of directional signs that are BELOW MoFR standards | 29.2 | 7.1 | 5.2 | 18.9 | 2.5 | 8.3 | 10.2 |
| | CI (±) | 24.8 | 12.8 | 6.7 | 14.0 | 3.7 | 12.6 | 7.9 |
| A3T4 | Proportion of tables that are BELOW MoFR standards | 8.6 | 33.9 | 7.4 | 8.5 | 13.1 | 15.6 | 12.9 |
| | CI (±) | 4.2 | 8.2 | 4.4 | 4.9 | 9.4 | 6.4 | 3.9 |
| A1Q3 | Proportion of toilets that are BELOW MoFR standards | 38.2 | 15.3 | 8.3 | 18.4 | 7.3 | 15.6 | 13.9 |
| | CI (±) | 12.3 | 14.1 | 7.7 | 7.3 | 4.6 | 11.3 | 6.3 |
| A2ES1 | Proportion of entrance signs that are BELOW MoFR standards | 38.4 | 40.2 | 19.3 | 18.5 | 40.1 | 21.7 | 26.2 |
| | CI (±) | 17.8 | 21.5 | 12.5 | 10.8 | 25.8 | 11.9 | 9.9 |
| A3FR4 | Proportion of fire rings that are BELOW MoFR standards | 31.6 | 49.7 | 26.2 | 23.8 | 28.3 | 37.5 | 31.4 |
| | CI (±) | 8.9 | 17.0 | 13.3 | 8.7 | 20.9 | 16.1 | 9.5 |
| A2K1 | Proportion of kiosks that are BELOW MoFR standards | 8.3 | 0.0 | 41.9 | 21.4 | 60.6 | 1.5 | 34.3 |
| | CI (±) | 25.6 | 0.0 | 28.9 | 18.3 | 36.4 | 1.5 | 21.1 |
| 6.8.2 | Proportion of fencing that is below standard | 0.0 | 100.0 | 3.4 | 0.5 | 67.0 | 8.9 | 8.0 |
| | CI (±) | 0.0 | 0.0 | 1.8 | 0.8 | 4.7 | 14.2 | 8.4 |
| 6.8.2 | Total Length of fencing that is BELOW standard (m) | 0.0 | 1507.1 | 1024.0 | 58.0 | 843.8 | 1629.4 | 2531.1 |
| | CI (±) | 0.0 | 0.0 | 536.5 | 93.5 | 59.1 | 2602.2 | 2674.4 |
| | **Other** | | | | | | | |
| 2.2 | Total length of ditches requiring repairs (m) | 6456.3 | 0.0 | 36841.6 | 1125.0 | 20262.5 | 21910.3 | 43297.8 |
| 2.2 | Average length of ditches requiring repairs per site (m) | 124.3 | 0.0 | 379.5 | 100.0 | 434.6 | 240.4 | 290.5 |

| Q | 3.4.1 Current Facilities | Proportion of Recreation Sites (%) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Site type | | | Region | | | All sites |
| | | MWF | MWOF | UM | CFR | NIR | SIR | |
| | **Remedial Works** | | | | | | | |
| 6.5.5 | Proportion of boat lauches requiring remedial works | 36.8% | 29.7% | 38.1% | 33.5% | 58.7% | 23.6% | 36.3% |
| | 95 % CI (±) | 23.0% | 23.9% | 18.0% | 17.8% | 24.6% | 19.4% | 13.5% |
| A2DS6 | Proportion of directional signs requiring remedial works | 48.2% | 42.1% | 23.5% | 33.2% | 11.0% | 40.1% | 31.9% |
| | 95 % CI (±) | 19.1% | 33.0% | 12.4% | 15.1% | 9.0% | 24.7% | 12.5% |
| A2K4 | Proportion of kiosks requiring remedial works | 42.4% | 19.9% | 56.2% | 32.0% | 70.1% | 36.3% | 50.0% |
| | 95 % CI (±) | 30.3% | 34.7% | 31.1% | 18.7% | 35.7% | 49.4% | 23.4% |
| A3T11 | Proportion of tables requiring remedial works | 44.1% | 58.6% | 61.4% | 53.5% | 49.5% | 64.1% | 57.5% |
| | 95 % CI (±) | 15.4% | 14.3% | 12.5% | 13.2% | 16.0% | 14.8% | 8.8% |
| A1Q4 | Proportion of toilets requiring remedial works | 50.3% | 23.5% | 14.2% | 35.1% | 7.9% | 22.7% | 21.1% |
| | 95 % CI (±) | 11.8% | 14.3% | 11.2% | 11.0% | 4.6% | 14.8% | 8.3% |
| A2ES2 | Proportion of entrance signs requiring remedial works | 56.2% | 43.2% | 48.7% | 33.7% | 60.7% | 46.2% | 48.5% |
| | 95 % CI (±) | 16.1% | 21.7% | 18.5% | 14.2% | 26.8% | 18.5% | 13.2% |
| A3FR7 | Proportion of fire rings requiring remedial works | 48.6% | 57.0% | 71.1% | 45.3% | 51.5% | 82.1% | 64.4% |
| | 95 % CI (±) | 14.6% | 15.5% | 12.5% | 12.4% | 22.0% | 10.0% | 8.9% |
| 6.6.4 | Proportion of dock/wharf/piers requiring remedial works | 96.6% | 13.4% | 89.1% | 67.7% | 100.0% | 85.7% | 85.4% |
| | 95 % CI (±) | 29.6% | 0.0% | 26.2% | 29.6% | 0.0% | 26.2% | 15.4% |
| 6.10.4 | Proportion of parking areas requiring remedial works | 0.0% | 0.0% | 55.9% | 13.3% | 39.4% | 39.3% | 35.8% |
| | 95 % CI (±) | 0.0% | 0.0% | 22.3% | 9.9% | 26.2% | 22.7% | 15.1% |
| 6.9.5 | Proportion of footbridges requiring remedial works | 19.7% | 0.0% | 68.7% | | | | 30.9% |
| | 95 % CI (±) | 18.8% | 0.0% | 19.4% | | | | 15.4% |
| A3C11 | Proportion of campsites requiring remedial works | 36.0% | 23.2% | 70.1% | 43.4% | 67.9% | 55.3% | 55.3% |
| | 95 % CI (±) | 10.5% | 14.1% | 14.2% | 9.1% | 18.8% | 17.5% | 10.2% |
| 6.8.5 | Estimated proportion of fencing requiring remedial works | 0.0% | 100.0% | 6.5% | 8.3% | 67.0% | 8.9% | 11.0% |
| | 95 % CI (±) | 0.0% | 0.0% | 3.9% | 9.2% | 4.7% | 8.2% | 8.8% |

| Q | 3.4.2 Road Works | Proportion of Recreation Sites (%) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Site type | | | Region | | | |
| | | MWF | MWOF | UM | CFR | NIR | SIR | All sites |
| 1.3 | Proportion of roads requiring grading (km) | 42.8 | 13.1 | 48.5 | 26.0 | 46.7 | 41.5 | 40.4 |
| 1.3 | Proportion of roads requiring cleaning and grading of ditches (km) | 9.6 | 0.0 | 15.6 | 12.3 | 4.6 | 14.8 | 11.7 |
| 1.3 | Proportion of roads requiring brushing (km) | 8.2 | 14.7 | 5.6 | 1.1 | 7.5 | 9.8 | 7.8 |
| 1.3 | Proportion of roads requiring subgrade repair (km) | 0.0 | 17.1 | 2.7 | 0.0 | 11.8 | 4.0 | 5.5 |
| 1.3 | Proportion of roads requiring gravelling (km) | 70.6 | 19.8 | 37.4 | 40.6 | 48.7 | 31.1 | 37.3 |
| 1.3 | Proportion of roads requiring remedial works | 65.5 | 15.3 | 68.5 | 38.0 | 62.9 | 59.5 | 57.0 |
| | CI (±) | 1.0 | 1.0 | 0.8 | 0.8 | 1.6 | 1.0 | 0.8 |
| 1.3 | Total length of road requiring remedial works (km) | 274.5 | 123.0 | 1782.4 | 230.40 | 649.37 | 1300.13 | 2179.90 |
| | CI (±) | 4.0 | 8.3 | 21.2 | 4.9 | 16.0 | 22.5 | 29.8 |

| Q | 3.4.3 Additional Facilities | Proportion of Recreation Sites (%) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Site type | | | Region | | | |
| | | MWF | MWOF | UM | CFR | NIR | SIR | All sites |
| | Toilets | 81 | 0 | 80 | 65 | 59 | 37 | 161 |
| | 95 % CI (±) | 23 | 0 | 4 | | | | |
| | Entrance signs | 15 | 67 | 28 | 10 | 37 | 63 | 110 |
| | 95 % CI (±) | 1 | 8 | 1 | | | | |
| | Kiosks | 24 | 7 | 234 | 104 | 87 | 75 | 266 |
| | 95 % CI (±) | 2 | 0 | 23 | | | | |
| | Directional signs | 97 | 32 | 475 | 147 | 83 | 374 | 604 |
| | 95 % CI (±) | 29 | 3 | 96 | | | | |
| | Campsites | 385 | 45 | 763 | 373 | 476 | 344 | 1193 |
| | 95 % CI (±) | 745 | 9 | 410 | | | | |
| | Tables | 258 | 49 | 833 | 97 | 327 | 717 | 1140 |
| | 95 % CI (±) | 323 | 10 | 247 | | | | |
| | Fire rings | 318 | 260 | 743 | 170 | 236 | 915 | 1321 |
| | 95 % CI (±) | 411 | 101 | 277 | | | | |

| | | Proportion of Recreation Sites (%) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Site type | | | Region | | | |
| Q | 3.4.3 Additional Facilities | MWF | MWOF | UM | CFR | NIR | SIR | All sites |
| 7.3 | Proportion of sites with excellent site design | 28.4 | 7.9 | 2.3 | 16.5 | 11.2 | 3.3 | 6.8 |
| | 95 % CI (±) | 13.3 | 5.6 | 3.7 | 9.0 | 11.2 | 2.0 | 3.1 |
| 7.3 | Proportion of sites with good site design | 41.5 | 45.6 | 41.1 | 29.6 | 57.9 | 39.3 | 42.3 |
| | 95 % CI (±) | 0.6 | 1.4 | 0.8 | 15.5 | 11.2 | 2.0 | 12.4 |
| 7.3 | Proportion of sites with moderate site design | 14.9 | 23.3 | 17.0 | 40.8 | 25.0 | 42.7 | 38.4 |
| | 95 % CI (±) | 13.3 | 23.2 | 17.3 | 17.9 | 18.1 | 18.0 | 12.5 |
| 7.3 | Proportion of sites with poor site design | 6.1 | 3.6 | 17.2 | 13.1 | 5.9 | 14.7 | 12.5 |
| | 95 % CI (±) | 6.3 | 3.1 | 13.8 | 12.9 | 10.0 | 13.0 | 8.8 |